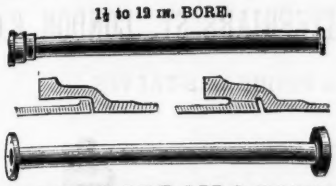
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LX. No. 1540.] LONDON, NOVEMBER 15, 1892. [44TH YEAR. PRICE 6d.

GAS AND WATER PIPES

1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,

Bon Lea Foundry,

SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF

SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

GLASGOW OFFICE: 24, GEORGE SQUARE.

Telegrams:

"BONLEA, STOCKTON-ON-TEES."

"SPRINGBANK, GLASGOW."

— ESTABLISHED 1830. —

PARKER & LESTER,

Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

WOLSTON'S

TORBAY PAINTS

Special Quotations to Gas Companies.

DARTMOUTH, DEVON.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL

AND GAS COALS.

Quotations and Analysis on application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

GASHOLDERS

C. & W. WALKER

Have completed a four-lift Holder nearly 200 feet high, of about 8 MILLION cubic feet, at the Beckton Gas-Works, London.

PURIFIERS;

PURIFYING MACHINES;

CO_2 AND TAR-EXTRACTING WASHERS; SCRUBBERS;

SULPHATE & SULPHUR PLANT;

PATENT SELF-SEALING RETORT MOUTHPIECES;

LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;

SOLE MANUFACTURERS OF WECK'S PATENT CENTRE-VALVE;

PATENT TAR PLANT; CONDENSERS;

SLIDE VALVES; TAR BURNERS; &C., &C.

WOOD SIEVES.

ADDRESSES:

MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE;

10, Finsbury Square, London.

"FORTRESS DONNINGTON." "FORTRESS LONDON."—Telegraphic.

SAWER AND PURVES,

LATE

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER,

Manufacturers of

IMPROVED CONSUMERS' WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS.

SPECIALITY: PATENT CASH PREPAYMENT METERS.

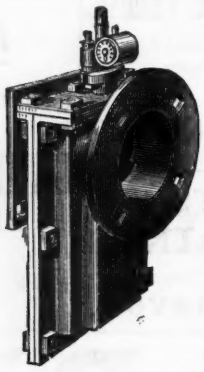
S. OWENS & CO., Hydraulic, Gas, & General Engineers, WHITEFRIARS ST., LONDON, E.C.

SOLE MANUFACTURERS OF

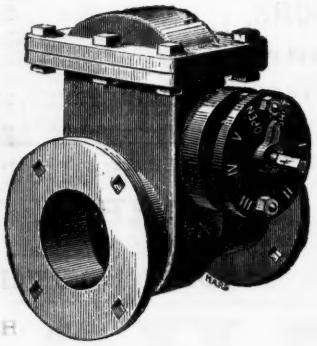
MANN & OWENS' PATENT SCREW & CAM, also FULL-WAY RACK & PINION GAS-VALVES.

REDUCED IN PRICE.

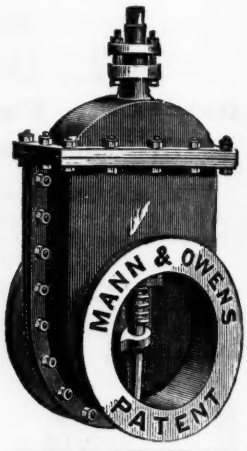
VALVE to OPEN DOWNWARDS.



BRIDGE VALVE
for Regulating the Seal
of Hydraulic Mains.



FULL-WAY RACK AND
PINION VALVE.



VALVE to OPEN UPWARDS.

Also Makers of Pillar Valves, Self-acting Bye-pass Valves, Outside Rack and Pinion Valves, Hydraulic Main-Valves, Disc-Valves, and Special Valves of all kinds. Improved Gas-Exhausters, Steam-Engines, Steam-Cranes, Boilers. Blake's Patent Steam-Pumps for Tar, Water, and Ammoniacal Liquor Hydraulic Coal-truck Lifts, Hydraulic Cranes, Hydraulic Apparatus for Lifting Purifier-Covers, and every description of Pumping Apparatus, &c., suitable for use in Gas-Works, made to order.

S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

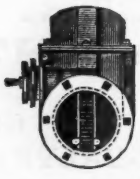
NEWTON, CHAMBERS, & CO., LIMITED

THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,
WITH RACK & PINION
OR
Internal or External
SCREWS, of all Sizes.

GASHOLDERS,
AND
Gasholder Tanks.



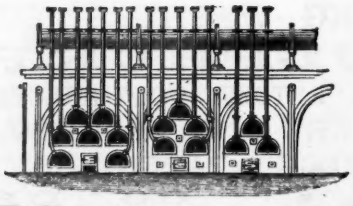
CAST-IRON RETORTS,

RETORT-BED FITTINGS,

And Retort-House Appliances

of every description,

Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

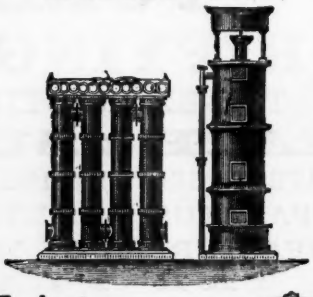


WROUGHT AND CAST IRON

CONDENSERS,

SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c,



PATENT

CENTRE VALVES

for working Purifiers.

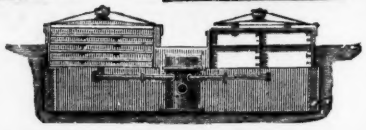
Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

THE BARROWFIELD IRON-WORKS, LIMITED,

Late LAIDLAW, SONS, & CAINE, Limited,

GAS ENGINEERS AND CONTRACTORS,

Telegrams: "GASOMETER GLASGOW."

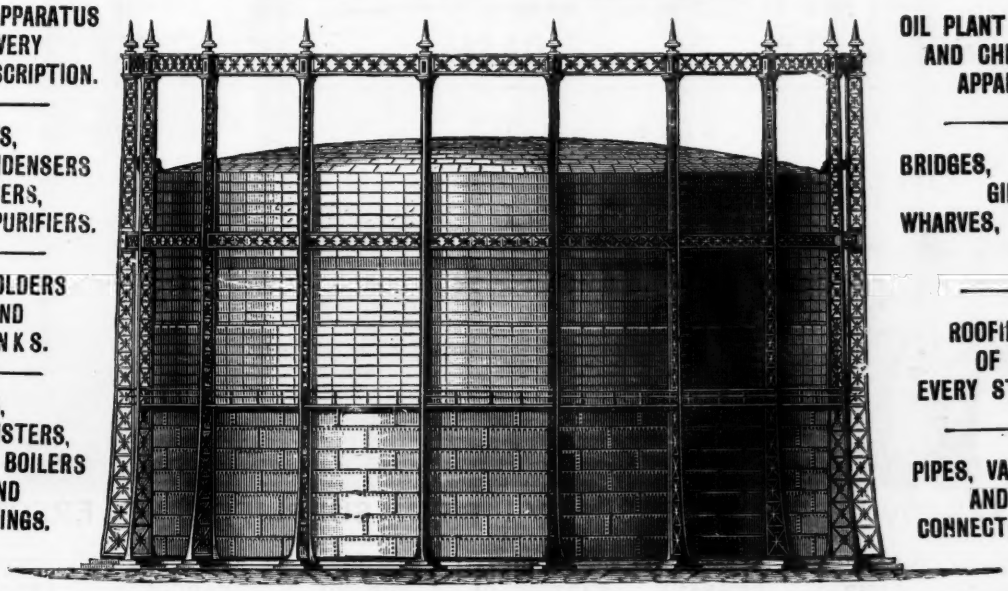
GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM BOILERS AND FITTINGS.



OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office: 6, LITTLE BUSH LANE, CANNON STREET.

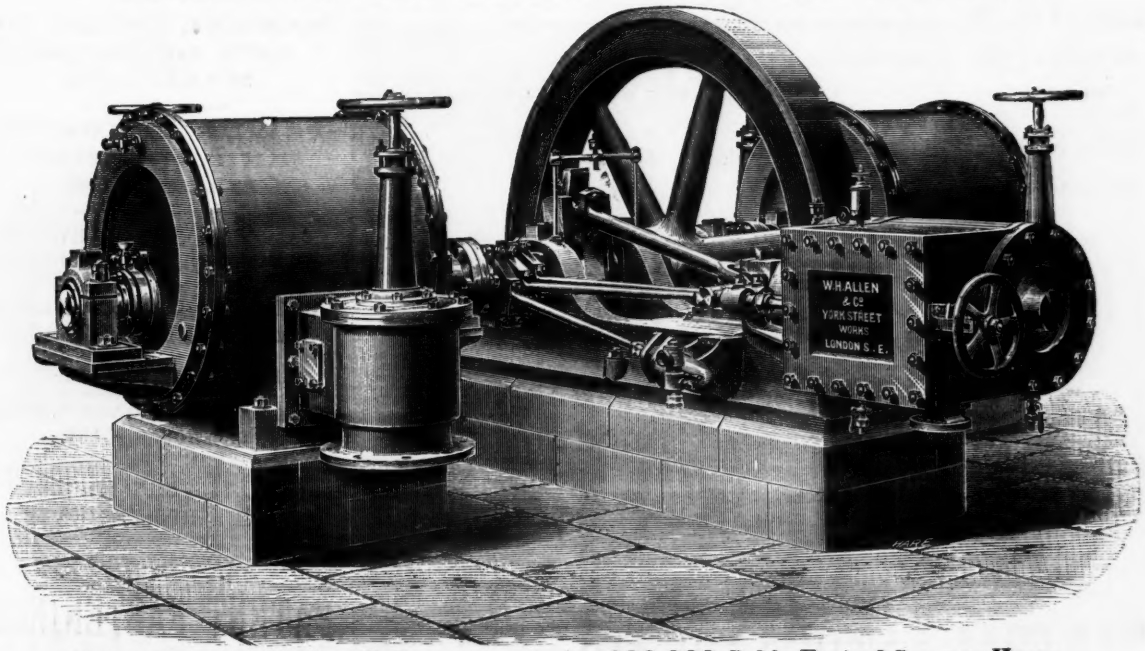
W. H. ALLEN & CO.,

York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.



Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.

TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, MAINS, RETORT LIDS, & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

WEST'S GAS IMPROVEMENT Co., Ltd.,

(Mr. JOHN WEST, M.Inst.C.E., *Managing Director*),

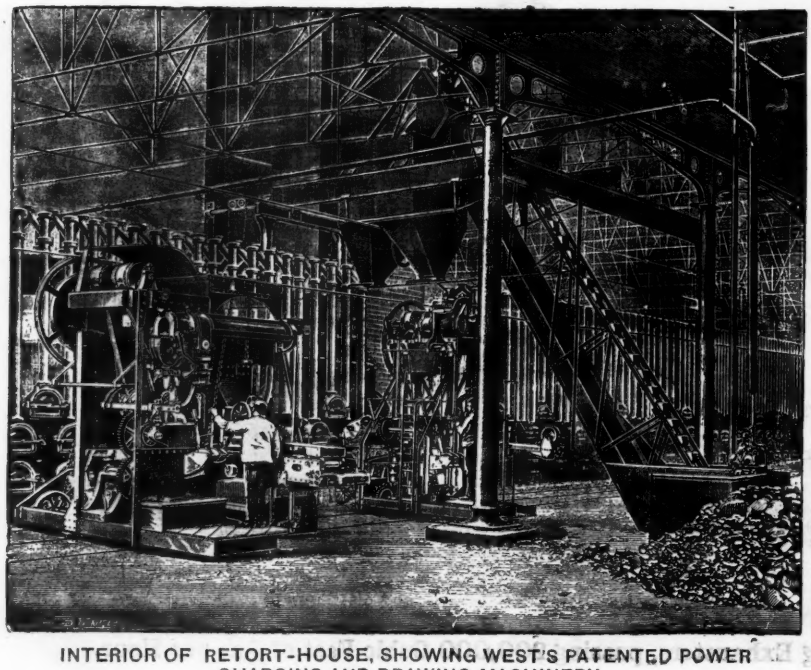
Engineers, Ironfounders, and Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

Manufacturers of

WEST'S PATENTED MACHINERY FOR CHARGING AND DRAWING GAS-RETORTS.

OVER **240** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.



INTERIOR OF RETORT-HOUSE, SHOWING WEST'S PATENTED POWER CHARGING AND DRAWING MACHINERY

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES.

COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY.

COKE BREAKING, CONVEYING, AND WASHING MACHINERY.

OXIDE ELEVATING MACHINERY.

COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT.

RETORT MOUTHPIECES WITH SELF-SEALING LIDS, FITTED WITH

KING'S PATENT FASTENINGS.

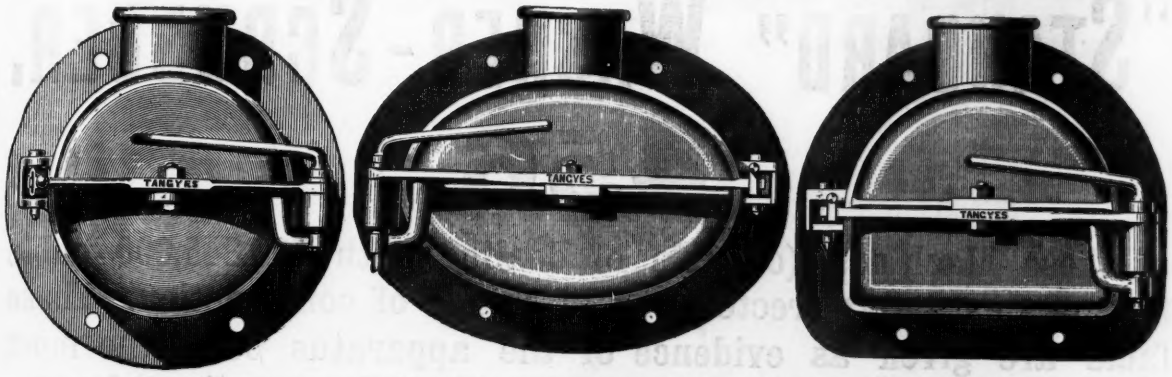
N.B.—The whole of these Fittings are made of Wrought Iron.

TANGYES LIMITED, CORNWALL WORKS, BIRMINGHAM.

AND AT LONDON, NEWCASTLE, MANCHESTER, GLASGOW, SYDNEY, MELBOURNE, JOHANNESBURG, GENOA, BILBAO, & ROTTERDAM.

MORTON'S SELF-SEALING RETORT-LID,

With Holman's Anti-Friction Catch, Self-Sustaining Cross-Bar, and Improved Eccentric Bolt.



These Retort Lids and Fastenings are made in three forms, round, oval, and ⌂ (as shown above), in each of which we have a very extensive variety of patterns, from which Gas Engineers contemplating the adoption of these Lids are recommended to make their selection, in order to avoid cost of pattern-making, delays, &c., &c.

QUOTATIONS WILL BE GIVEN ON RECEIPT OF PARTICULARS OF REQUIREMENTS.

LIST OF PATTERNS ON APPLICATION.

Telegrams: "TANGYES, BIRMINGHAM." No. 90 E.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A Special Compound for the cure of Stopped Ascension-Pipes. A couple of charges will clear a stopped Pipe, and an occasional charge keeps them clean; also increases the Make per ton and the Illuminating Power.

Prices and Particulars on Application. HEAD OFFICES: CORPORATION STREET, BIRMINGHAM. TELEGRAPHIC ADDRESS: "EVESON, BIRMINGHAM."

THE WATERBLEAN COLOR AND MINING COMPANY, MILLOM, CUMBERLAND.

TELEGRAPHIC ADDRESS: "WATERBLEAN MINES, MILLOM." PORTERAGE, 1s. 6d.

VENETIAN AND OXIDE REDS for the Manufacture of ANTI-CORROSIVE PAINTS.

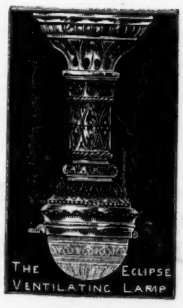
Specially adapted for the Ironwork of Gas-Works and wherever subject to exposure.

G. J. EVESON, Proprietor, Corporation Street, Birmingham.

ORDERS TO BIRMINGHAM, OR DIRECT TO THE MINES.

WENHAM LAMPS

With Recent Improvements.



PRICES

FROM

STILL THE BEST REGENERATIVE LAMP.

20/-

CHEAPEST! MOST ORNAMENTAL AND RELIABLE!

APPLY FOR NEW SEASON'S CATALOGUE.

THE WENHAM COMPANY, LTD., UPPER OGLE STREET, LONDON, W.

KIRKHAM, HULETT, & CHANDLER,

LIMITED.

(SIDNEY HERSEY, Managing Director.) (J. CHANDLER, Engineer.)

PATENT

"STANDARD" WASHER-SCRUBBER.

456

of these Machines (capable of dealing with 436,345,000 cubic feet of Gas daily) erected and in course of construction. These facts are given as evidence of the apparatus being the most efficient of any in the market for the extraction of AMMONIA, CARBONIC ACID, AND SULPHURETTED HYDROGEN FROM COAL GAS.

70 of the above Machines have been constructed according to the Company's latest Patent, which has also been applied to 41 original pattern Machines.

TESTIMONIALS.

The Gaslight and Coke Company,
Horseferry Road, Westminster, S.W.,
Nov. 25, 1889.

Messrs. KIRKHAM, HULETT, AND CHANDLER, LTD.,

Gentlemen,

In reply to your inquiry respecting the result of putting Wooden "Bundles" into some of the Washer-Scrubbers at our Beckton Station, I beg to say they have answered admirably for the few months they have been in; and I think them a decided success.

I am, yours truly,
(Signed) G. C. TREWBY.

NOTE.—Orders since received for four 3,500,000 cubic feet per day Machines for Beckton; and two 3,000,000 cubic feet for Kensal Green, &c., &c.

Extract from the JOURNAL OF GAS LIGHTING, &c., for Sept. 27, 1892, referring to the visit of the Members of the Eastern Counties Gas Managers' Association to the Lowestoft Gas-Works—

"Mr. J. Ayris has one of Messrs. Kirkham, Hulett, and Chandler's "Standard" Washer-Scrubbers in operation (capable of dealing with 500,000 cubic feet of gas per 24 hours); and of the working of this machine he spoke very highly."

Estimates furnished for cost of altering original pattern Patent "Standard" Washer-Scrubbers, or for the supply of New Machines.

ADDRESS:—

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

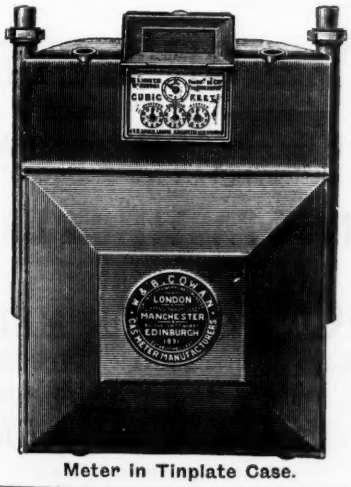
W. & B. COWAN'S DRY METERS.

These, which are made at our Factories in London, Manchester, and Edinburgh, are constructed of the best charcoal double tinned plates, and the diaphragms of the best Persian sheepskins specially selected and prepared. The diaphragm is tied with Bessemer steel wire, between which and the leather a band of flax webbing is interposed, so as to protect the latter. By this means leakage at the tying is rendered impossible.

Leakage at the index-box is effectually prevented by the adoption of a grease-cup in connection with the ordinary stuffing-box. A prolonged experience of this modification, which we introduced in 1878, justifies its recommendation as a substantial improvement.

Excepting as regards the cases, the above remarks apply equally to our cast-iron cased Dry Meters, which are found very useful for certain special purposes.

All the sizes of these Meters are of neat design, and are unexcelled for workmanship, material, and finish. The most careful supervision is exercised at every stage of their manufacture, and only the highest class of skilled labour is employed.



Meter in Tinplate Case.

Meter in Cast-Iron Case.

Large Stocks always Ready for Immediate Delivery or for Shipment.

W. & B. COWAN,

ESTABLISHED 1827

SMITH SQUARE WORKS, WESTMINSTER, **LONDON, S.W.** TELEPHONE No. 3280. "DISC LONDON."

DUTTON STREET WORKS, **MANCHESTER.** TELEPHONE No. 1843. "DISC MANCHESTER."

BUCCLEUCH STREET WORKS, **EDINBURGH.** TELEPHONE No. 753. "DISC EDINBURGH."

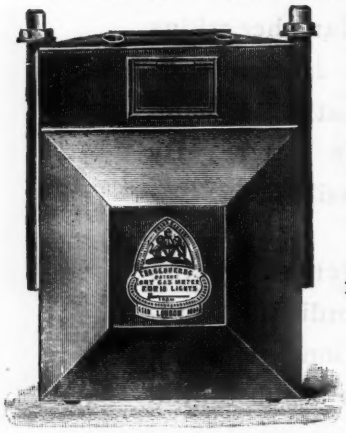
TELEGRAPHIC ADDRESSES:

[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

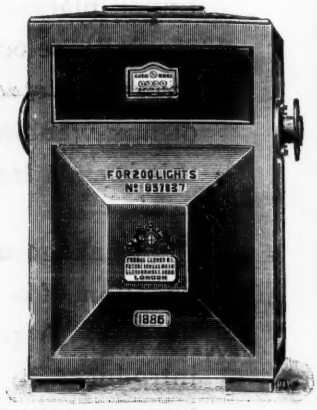
THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.



1st.—Are a remedy for all the defects of Wet Meters.
2nd.—Are suitable for all Climates, whether hot or cold.
3rd.—Incur no loss of Gas by Evaporation.
4th.—Cannot become fixed by Frost, however severe.
5th.—Are the most accurate and unvarying measurers of Gas.
6th.—Prevent jumping or unexpected extinction of the Lights.
7th.—May be fixed either above or below the level of the Lights.
8th.—Cannot be tampered with without visibly damaging the outer case.
9th.—Will last much longer than Wet Meters.
10th.—Will not cost more than one-half for repair that Wet or Water Meters do.

Are upheld for five years without charge.



Telegraphic Address: "GOTHIC LONDON."
Telephone No. 6725.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

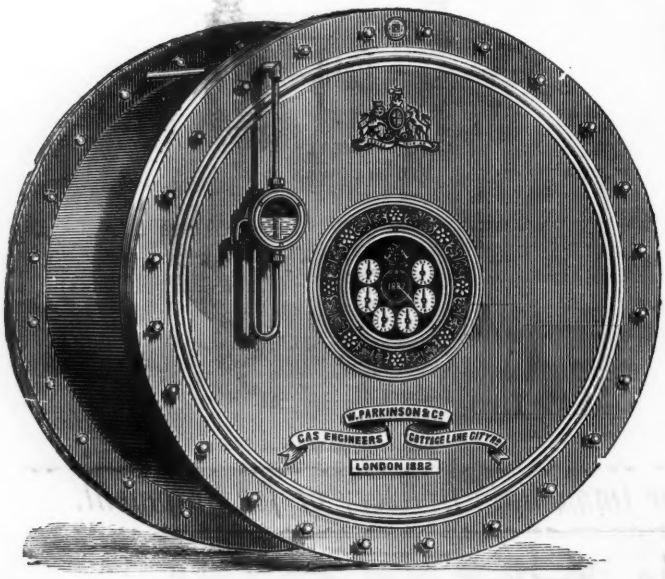
BRISTOL: 62, VICTORIA STREET. *Telegraphic Address*: "GOTHIC."

BIRMINGHAM: 3, BRIDGE ROW, DERITEND. *Telegraphic Address*: "GOTHIC."

LEEDS: BOAR LANE CHAMBERS, 4, BASINGHALL STREET. *Telegraphic Address*: "GOTHIC."

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address*: "GOTHIC."

W. PARKINSON & CO.



STATION METERS

IN

ROUND or SQUARE TANKS,

FITTED WITH PATENT

THREE-PARTITION DRUMS.

MORE THAN

300 STATION METERS,

Varying in size from **1200** to **200,000** cubic feet per hour, have been sold, fitted with

THREE-PARTITION DRUMS,

Since their introduction.

ROUND METERS as above are kept in Stock in all Sizes ready to send away at the shortest notice. Compact, portable, and very easily fixed. An Improved Overflow Water-line Regulator fitted to every Meter.

DURABILITY UNEQUALLED. SOME HAVE BEEN IN CONSTANT USE FOR OVER 60 YEARS.

COTTAGE LANE WORKS, CITY ROAD, LONDON. Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS, BIRMINGHAM. Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE, MANCHESTER. Telegraphic Address: "PRECISION."

[See also Advt., p. 884.

CONTENTS.

EDITORIAL NOTES:—

GAS, LIGHTING, &c.— PAGE

Climatic 849
The Lesson of Homestead 849
The Appeal in the Blackburn Explosion Case 850
The Southern District Meeting 850
The City and Guilds of London Technological Examinations 850

WATER AND SANITARY AFFAIRS—

The East London Water Company and their Consumers—Ingenious Objections to the Payment of Water-Rates 851
The St. Saviour's District Board of Works and the Quality of the South London Water Supply 851

ESSAYS, COMMENTARIES, AND REVIEWS:—

Gas and Water Companies in the Stock Market 852
Electric Lighting Memoranda 852
The Problem of the Artisan's Dwelling 853

NOTES:—

Flanged Plates *v.* Angle-Irons 855
Waterproof and Fireproof Cement 855
The Carbonic Acid in Air 855
Lysol as a Disinfectant 855

TECHNICAL RECORD:—

Southern District Association of Gas Engineers and Managers—
General Business 855
Mr. C. C. Carpenter on Purification 855
Mr. William Young's New Oil-Gas Plant 860

CORRESPONDENCE:—

Anthracene 862
Regenerative *v.* Ordinary Settings 862
Guiding Gasholders without External Framing 863
Gadd and Mason *v.* Manchester Corporation 863
Stopped Ascension-Pipes 863
Carrying Gas-Mains through Water 863
The Electric Lighting of the Safe Deposit Company's Premises 863

LEGAL INTELLIGENCE:—

Supreme Court of Judicature—Court of Appeal—Paterson *v.* Mayor and Corporation of Blackburn; The Blackburn Explosion 864
High Court of Justice—
Chancery Division—Davis *v.* Matlock Water-Works Company, Limited 864
Queen's Bench Division—East London Water Works Company *v.* Foulkes 865

MISCELLANEOUS:—

The Sheffield Town Council and the Gas Company's Provisional Order . 867
A Large Gasholder for Bristol 868
Increased Storeage at the Carlisle Gas-Works 868
Meeting of the Dunedin Suburban Gas Company, Limited 868
Opening of the Godstone Gas-Works 869
A Colliery Owner on Gas Coal Contracts 869
Notes from Scotland 870
Current Sales of Gas Products 871
Coal Trade Reports 871
Gas and Water Companies' Stock and Share List 873

PARAGRAPHS.—The Presentation to Mr. M'Gilchrist, 851—Election of Mayors, 851—Mr. F. Bailey, 852—Death of Mr. C. Balls, of Cambridge, 852—Death of Robert O. White, 852—Spring Foundations for Gas and Steam Engines, 852—The Use of Coal Gas for Ventilating Sewers, 852—Grant to the Royal Institution, 853—Institution of Civil Engineers, 854—Brown's Directory of American Gas Companies, 854—Death of Mr. Maskell Peace, 854—The Damage to The Gaslight and Coke Company's Mains by the Fire on the Underground Railway, 854—Tar and other Gas Residuals in the United States, 854—A New Aqueduct for Dublin, 863—Singular Gas Explosion at Bolton, 863—Hexham Gas Company, 863—Driving Dynamos with the Waste Heat from Gas-Retorts, 866—Electric Lighting at Bowden and Altrincham, 868—Slough Gas Company, 868—The Kirkleatham Water Arbitration Award, 869—The Price of Gas at Preston, 869—Buenos Ayres (New) Gas Company, Limited, 869—The Quality of the South London Water Supply, 869—Contractors' Responsibilities, 869—Reduction in the Price of Gas at Kineton, 871—Sale of Shares, 871—The Suggested Acquisition of the Accrington Gas and Water Undertaking by the Corporation, 871—Nelson Gas Workers and their Wages, 871—Recent Gas Exhibitions, 871—The State Government of San Paulo and the Cantareira Water and Drainage Company, 871—The State of the River Thames, 872—Can a Consumer by Meter Give Away Water? 872—Berlin Water Supply, 872—Liability for Gas-Meters, 872—Madrid Electric Lighting and Water Supply, 872—The Pollution of Rivers, 872—The Bury Gas and Water Works, 872—New Water Reservoir for Ripon, 872—Extension of the Wigan Water-Works, 872—Hebden Bridge Water Supply, 872—An Additional Water Supply for Matlock Bath, 872—More "Play Time" for Miners, 872—The Smoke Nuisance at the Coventry Gas-Works, 872—Fylde Water Company, 872—A Water Consumer Fined at Ventnor, 872—Proposed Additional Water-Works for Lisburn, 872—The Libourne (France) Water-Works, 872—The Supply of Water for Fires, &c., at Finchley, 873—Gas *v.* Steam Engines for Pumping Water, 873—A Peculiar Occurrence in the Liverpool Gas Supply, 873—The Wolverhampton Corporation and the Gas-Works, 873—New Joint-Stock Companies, 873—The Lighting Question at Askam, 873—Electric Lighting for Yarmouth, 873—The Water Supply of Bradford Out-Townships, 874—The Water-Works Question at Chatham and Rochester, 874—Water and Sanitary Works in France, 874.

TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but Orders for Alterations in or Stoppages of PERMANENT ADVERTISEMENTS should be received Not Later than the FIRST POST on SATURDAY.

Telegraphic Address: "GASKING LONDON."

Telephone Number: 2759.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 15, 1892.

Climatic.

A WEEK of intermittent fog, which affected the suburban districts even more than it did the central parts of London, culminated on Saturday last in a visitation of "darkness "that might be felt" over the whole Metropolitan area. We have been assured upon high authority that fogs are just what the central electric lighting stations like; but, however this may be, some of these establishments effectually "dissembled their love" during this most unpleasant time, and left the street traffic to make the best of the aid afforded by the shop and house lighting, which, of course, was mainly gas. The City of London Electric Lighting Company did not display that readiness to make light, in more senses than one, of a serious fog with which their admirers had credited them in advance. Meanwhile, there was a tremendous drain upon the resources of the Gas Companies; and it is already certain that the increased manufacturing and storeage accommodation which the larger undertakings have been busy during the last summer in getting ready will be fully required this winter. A good deal of silly talk has been heard of late from various quarters respecting the imminent decadence of the Metropolitan gas industry: and some of the Trade Union leaders in particular have tried to make out that there is less employment to be had in gas-works than heretofore, on account of the imaginary falling off in the consumption of gas. All this airy nonsense disappears at the first touch of such a reality as that which recent meteorological influences have put in evidence. A downright dingy, dirty, wretched week of weather such as we seem to get in London more frequently than ever, makes everybody fly to gas for light and comfort. Not only in the streets, but in the railway stations, when it becomes a question of carrying on business under the worst conditions, the "light of luxury" is left alone; and the reliable friend of the townsman is brought forward as though nothing else had ever been heard of. Although the experience is not a very enjoyable one, it is instructive to make a pilgrimage through a mile or two of the most frequented of the London thoroughfares when at midday it is impossible to see across the street. Here and there a huge industrial or commercial establishment—a printing house or factory for the manufacture of fancy goods—looms grandly through the thickened atmosphere, radiating light from roof to basement. The best effect, however, is produced by the shops wherein high-power recuperative lamps are hung over the doors, or along the front, or where clustered Argands or flat-flame burners strongly illuminate the goods exposed in the windows. These places irradiate the neighbourhood in a style unapproachable by other means. As for the wider street crossings and the railway yards, one longs, in the absence of a sufficiency of high-power gas-lamps, for a few good "flares" of the Lucigen type. The sparse electric arcs are utterly ineffective at such times. They seem lost in the upper air; and a curious effect is produced by the unusual prominence of the glowing carbon spark, which gives the most powerful arc the aspect of a rather poor incandescent lamp. As to the latter, their lower tone helps them to penetrate the air that enwraps them like a dirty blanket; but the pleasant fiction about a nominal 8-candle lamp being to all intents and purposes equal to a flat-flame gas-burner, is utterly demolished by the inconsiderate atmosphere. All these are old truths; but it is just as well to keep them in the front when occasion serves.

The Lesson of Homestead.

AN instructive statement has come to hand from an American source respecting the profit and loss of the Homestead strike; and it would be greatly to their edification if our New Unionist leaders and their dupes would take more account than they do of the order of facts represented by this report. As it is, there are no newspapers or other publications specially devoted to the Socialistic Trades Union propaganda that display wisdom superior to that of the fabled ostrich, which sticks its head into the sand, and then endeavours to banish the unpleasant by refusing to see it. Now, this is, in brief, the story of Homestead up to date: Notwithstanding the sanguinary conflicts that marked the outbreak of the strike at the works of the Carnegie Steel Company, when a loosely-organized Government proved for the time being powerless to grapple with the armed and desperate strikers, and the efforts of the employers to retain command of their own property resulted in something indistinguishable from civil war upon a small scale, the Company are at the present time in full possession of the field. Non-Union men are doing the work, coming and going without molestation; while the strikers either walk the streets in idleness, looking for a day that will never

come, or are seeking employment elsewhere. A few are awaiting their trial for murder and treason; and until their case is settled the semblance of a contest will be kept up. But afterwards the great Homestead strike of 1892 will be a matter of history. Even now, the last of the State troops have gone home, and the neighbourhood is left to its pristine quiet. Yet here was the most favourable occasion for the exercise of the tactics so admired by the head of the Gas Workers' Union, that ever presented itself to a band of desperate men. The "capitalists" were at their mercy; the policeman was absent. And the upshot of all this advantage to the side of violence is that the condition of employment at Homestead is just the same as it would have been if the forces of law and order had been as perfectly operative as they were in South London on the occasion of the gas stokers' strike. Many homes have been rendered desolate; the taxpayers have to pay heavily for the extravagant levy of troops rendered necessary by the first short-lived triumph of the strikers over their opponents, the employers' men; the employers are crippled in their capacity to pay wages; and the Union men have lost both work and savings. Not one point for which the men struck has been gained by them. They have not compelled the employers to recognize the Union, except in having nothing to do with it; and they have made openings for non-Union labour which it would previously have sought in vain. On the other hand, the Carnegie Company have gained everything for which they contended. They declared their intention of running their mills on the terms offered to the men in June last; and they are now doing, and will continue to do it. This was all that was at stake, on the part of the employers; and in gaining this point they have all they require.

Surely, it is high time for labouring men to take to heart the lesson of these events, and to insist upon it that the men whom they pay to orate to them on Sunday afternoons should also look the facts in the face, and not talk as though Socialistic dreams were actualities. Why did the Carnegie Company win the day at Homestead, and why did the strikers lose it? Simply because the former acted within their rights in the community, and the latter were wilful transgressors. There is no mystery about this central truth, though all the Fabians and Marxists out of Bedlam were to weave their long-winded, high-flown verbiage round it. Whether under a Socialistic or an Individualistic *régime*, the side in any dispute which has the right to call in the policeman is bound to win in the long run, even though, in the absence or through the inefficiency of the policeman, his place is taken later on by many soldiers. Neither policemen nor soldiers create the right they enforce, which remains inherent in all social systems. It is their very life; and forms of Government are only valid in so far as it inspires and directs their action. Where this right exists not, there is anarchy; and in this condition men do not make steel, or gas, or anything else. They simply murder one another; and the earth they inhabit becomes waste.

The Appeal in the Blackburn Explosion Case.

THE appeal of the Blackburn Corporation against the decision of the Manchester Assize Court, awarding damages to the widow of a victim of the explosion of gas in the cellar of the Crown Hotel, Blackburn, has been heard by the Master of the Rolls and Lords Justices Lopes and Kay, and been dismissed with costs—their Lordships not even calling upon Counsel for the respondent. It is unnecessary to recite the particulars of the accident, or its consequences, as these were fully recorded and discussed in the JOURNAL at the time. We never entertained the smallest doubt respecting the liability of the Corporation for what happened; and this opinion receives ample confirmation in the observation of the Master of the Rolls that, since the cutting off of the gas from the meter in the Crown Hotel vaults was intended to be permanent, the Corporation were bound to do the work thoroughly. This, in the opinion of the jury who tried the test case, was not done; and the jury are now held to have been fully justified in ascribing negligence to the Corporation on this score. "Gas," as Lord Esher remarked, "is so dangerous a thing "that it requires the greatest precaution, whether "the supply is intended to be cut off permanently "or even only temporarily. The jury has properly "looked upon the fact of the defendants not having "cut off the supply of gas to Ormerod's meter either "at the main or at the place where it entered the "cellar of the inn as showing negligence." This is common sense as well as good law, and no allegation of local use and wont can weigh against it. It is stated that claims amounting to between £20,000 and £30,000 have been made upon the Blackburn Corporation in consequence of this disaster. It is quite possible, and deplorable; but troubles of this kind can only be got over in one way—by paying. It was perhaps the duty of the Blackburn Corporation to appeal, in the interests of the ratepayers; but the operation has not been a profitable one for them.

The Southern District Meeting.

THE members of the Southern District Association of Gas Engineers and Managers met on Thursday last at the Holborn Restaurant, under the presidency of Mr. A. Dougall, of Tunbridge Wells; the principal business being the reading and discussion of a paper by Mr. C. C. Carpenter, of Vauxhall, upon the perennially interesting subject of "Purification." Mr. Carpenter's observations, which we reproduce elsewhere, are rather suggestive than conclusive; for while his paper contained a great deal of positive information, it touched upon a number of points that still require clearing up. It is very desirable that Gas Managers' Associations should keep old questions from dropping into the cold shade of neglect; and while it is open to be argued that there is not much that can be called new to be said on such subjects as purification, naphthalene, stopped ascension-pipes, and so forth, it would be a mistake to discourage the reading and discussion of papers upon them. There is a certain appropriateness in posing "Purification" as a debateable topic just now, seeing that during the past year a good many gas managers in the South of England have been troubled to keep down the sulphur—a trouble which they agree in ascribing to the mixtures of strange coals forced upon them as a consequence of the Durham strike. It may probably be claimed for the Southern gas managers that sulphur purification has more practical interest for them than it has for the members of any other District Association. And it is worthy of remark that while the tenor of last Thursday's discussion went to show that a good deal of trouble and unremitting care is required to keep the sulphur impurities of coal gas as low as is practicable with known methods of purification, most of the men who take this trouble admit that the object sought is a desirable one. This has always been our attitude upon the sulphur question. We believe that the difference between gas with 40 grains of sulphur in every 100 cubic feet of it that reaches the consumers' burners, and gas with 15 grains or less, is worth working and paying for. Gas of the former grade may be good enough for the mill or the workshop, especially where there is no better to be had; but no man in his senses would pretend that gas completely devoid of sulphur would not be worth considerably more than this neglected stuff. Since sulphur-free gas cannot be produced, it is right and reasonable that people should desire to get as near as they can to this point of perfection. As Mr. Carpenter remarks, moreover, the cost of sulphur purification is generally overrated by those who ignore the consideration that ridding the gas of this impurity also means the removal of carbonic acid; and we have often argued that a gas-works in which the sulphur compounds are taken out as completely as possible, is likely to be one smartly managed in other respects. There is quite enough temptation in their circumstances for gas manufacturers enjoying statutory protection to go to sleep, without adding that of permitting them to send out any sort of gas they choose. But there is reason in all things; and the pedantry of Refereedom is as pernicious as the laxity of gas making in the style of the Local Authorities who test their own gas, and say as little about sulphuretted hydrogen as they can. Mr. Carpenter is the President-Elect of the Association; and his Inaugural Address will be looked forward to with more than usual interest, as affording him an opportunity for completing the observations he began last week.

The City and Guilds of London Technological Examinations.

THE report of the Examinations Department of the City and Guilds of London Institute upon the Technological Examinations for 1892 is of a highly encouraging nature; and we have to congratulate the Committee (of which Mr. G. Matthey is Chairman) and Sir Philip Magnus, the Superintendent, upon the evident progress of their most

worthy enterprise. Fourteen years ago, when this work was started, the term "technical education" was not a name to conjure with. The effort of the Institute to systematize the acquirement, and to establish a standard of excellence in technics of various kinds, was an experiment foredoomed, in the estimation of many estimable persons, to failure. One can understand the scorn with which the "practical man" would regard the proposal to examine a man in plumbing, cloth-weaving, and indeed almost any of the branches of handicraft which the Institute essayed to deal with in this way for its good. It would naturally escape the purview of such a man that, as a matter of historical fact, examination in the practice of arts and handicrafts is a very old custom indeed; dating from the palmy days of those old guilds whereof the names, and some, at least, of the corporate property, remain to the present day. Nobody could set up as a smith in the period of the prince of smiths—Quentin Matsys—until he had satisfied the masters of the craft and mystery as to his competence as a workman. In resuming this time-honoured function, so long left in abeyance, Sir Philip Magnus and his supporters had a great deal to contend with. There were difficulties within and without; and much weeding of examiners and ordering of classes of instruction had to be gone through before a satisfactory degree of correspondence could be established between the handicrafts and occupations as actually carried on, and the representations of them in the system of the Institute. We believe and are glad to bear witness that this necessary connection has now been secured in the generality of the subjects included in the programme of the Institute. In some the task has been more difficult of accomplishment than in others. Where a pure handicraft is in question, such as carpentry, it is, of course, easy to impose such a test upon candidates as shall effectually bar the way to a pass certificate for all but real followers of the trade. In such subjects as gas manufacture, on the other hand, there is obviously more risk of admitting aspirants who have merely "crammed" for a pass, especially as there is little opportunity for forming classes of suitable students. In this case, everything depends upon the tact and acuteness of the examiner; and of late years the Institute have been fortunate in this respect, while the students of gas manufacture all over the British Empire have found in the examination papers a most valuable guide for their studies, which in few instances have the advantage of any other. Last time, as we learn from the report, 54 candidates presented themselves for examination in this subject, whereof only five are entered as having been students in attendance upon a registered class for instruction. There were thus 49 candidates who were otherwise prepared. The percentage of passes was remarkably good. Of the five class-attendants, four passed; and of the self-taught 49 no less than 41 satisfied the Examiner. This total number of candidates is a very fair one, having regard to the extent of the field for employment presented by the industry. We hardly expect to see it largely increased, although the actual limit has probably not been reached. Confidence in a test of capacity for following such a peculiar calling as that of gas-works management must grow slowly. We believe that it is growing, in regard to the Institute examinations; and so long as the Institute carry on their work in this respect in the style which has characterized it of late years, we shall exert all our influence in supporting it, as a beneficial influence upon the gas industry at large.

The Presentation to Mr. J. M'Gilchrist.—Our readers may remember that, at the last meeting of the North British Association of Gas Managers, it was decided to present Mr. James M'Gilchrist, Dumbarton, with his portrait, in recognition of his services as Secretary and Treasurer of the Murdoch Memorial Fund. The presentation will be made to-morrow afternoon, at Macrae's Victoria Hotel, Glasgow; and it will be accompanied by one to Mrs. M'Gilchrist.

Election of Mayors.—Among the gentlemen who were elected last Wednesday to fill the office of Mayor for the current municipal year, we notice Mr. Henry Willey, of Exeter, and Mr. Alderman Lawley Parker, of Birmingham (second year). Mr. Willey's name is well known to gas engineers; and that of Mr. Lawley Parker will always be associated with the important scheme of water supply which Parliament sanctioned last year for the city of which he has again been chosen to fill the office of Chief Magistrate.

WATER AND SANITARY AFFAIRS.

It is to be hoped that the East London Water Company have not many consumers in their district so hard to satisfy as Mr. Foulkes, against whom they have found it necessary to institute an action, conducted before Mr. Justice Wills in the Queen's Bench Division of the High Court of Justice last week. We give a full report of the case in another part of our columns; and its perusal must convince every unprejudiced reader of the moderation and reasonableness of the course pursued by the Company. They claimed to recover from the defendant more than £200 for arrears of water-rates due last Christmas in respect of the supply given to sundry houses at Stratford and Leytonstone. Had Mr. Archibald Dobbs been concerned in the case, the objections urged against the claim could scarcely have been more varied and ingenious. For some length of time the defendant had been paying the water-rates as owner of the houses in question; yet he made it a plea before the Court that during this period he had parted with some of the houses, and therefore could not be sued for all. In disposing of this point, his Lordship held that, as the defendant had dealt with the Company on the footing of being in all cases the owner, he could not now plead otherwise. Whatever may have been the fact, we conceive that the defendant was able to take care of himself about this matter, in virtue of the arrangement by which, as he stated in Court, he paid the water-rates for the other owner, apparently his brother, as a matter of convenience. It was also in his power to give due notice to the Company when the change of ownership took place. The houses being just outside the Metropolitan area, the defendant was in a position to raise a question as to the annual value; and it remains with the Official Referee to see what is the right amount, though at present there is nothing to show that the Company made a wrong estimate. The dispute on this head also came late in the day. Of course, the famous bath question was brought into the case. The houses having a rental of less than £30 a year, the Company's Act provided that water supplied for baths was to be the subject of an agreement—no scale being specified. Accordingly, 4s. per annum was demanded for each bath. This sum the defendant paid. The evidence as to what was a fair charge did not come before the Court; and the matter was therefore relegated to the Official Referee. The Judge necessarily avoided expressing any opinion on the subject; but he gave no intimation that he thought the charge unreasonable. A contention by the defendant as to the allowance on the water-rates for empty houses was amicably settled; or rather, we might say, it came to nothing. So the matter rests; and it affords an example of how a public Company may be forced into litigation while doing their best by courtesy and concession to avoid such an issue. Mr. Foulkes is doubtless an estimable citizen; but to the East London Water Company he must have appeared as a rather troublesome customer.

Dr. R. Bodmer, the Medical Officer of Health to the St. Saviour's District Board of Works, persists in complaining that the water supplied by the Lambeth and the Southwark and Vauxhall Companies is "of un-"satisfactory purity." About two months ago the St. Saviour's Board, alarmed by the statements of Dr. Bodmer, sent a copy of his report to the Local Government Board and to the London County Council. To the Council they made a request that inspectors should be appointed to examine the filter-beds of the two Companies, and see that filtration was effectually performed. We pointed out at the time that the St. Saviour's Board were discrediting existing authorities; Dr. Frankland's analyses being set aside; and General Scott ignored in his capacity as the Metropolitan Water Examiner. The analyses performed by Mr. Crookes and Dr. Odling were also disregarded. The St. Saviour's Board have now gone a step farther; asking the County Council to insert a clause in their next Parliamentary Bill, whereby they shall be authorized to appoint inspectors of filter-beds and works—these officers also to inspect all watercourses running into the river above the intakes. The Thames Conservators are thus passed by as of no account. In the meantime, a letter has been received from the Local Government Board, in which General Scott proposes that further samples shall be taken of the incriminated waters—notice of time and place to be given to the Companies. The St. Saviour's Board consider that no notice ought to be given; and they have

stated their views to this effect in a letter addressed to the authorities at Whitehall. For our own part, we can see very little utility in the proposed analyses. The results will probably be the same as before; and Dr. Bodmer will continue to complain, although Dr. Frankland pronounces the supply to be "of good quality," while Mr. Crookes and Dr. Odling show that the figures fail to support Dr. Bodmer's conclusions.

Mr. F. Bailey has recently resigned the managership of the Retford Gas-Works, which he has held for the long period of 42 years.

Death of Mr. C. Balls, of Cambridge.—We regret to record the death on Saturday last, at an advanced age, of Mr. Alderman Charles Balls, Chairman of the Cambridge University and Town Gas Company, of which he had been a Director upwards of 44 years. Those of our readers who were present at the meeting of the Eastern Counties Association of Gas Managers at Cambridge in September last year, will doubtless recollect that Alderman Balls was introduced to the members, in company with the Mayor, at the opening of the proceedings, and offered them a kindly welcome to the town. He remained during the transaction of the business; and expressed his pleasure at having had an opportunity of listening to the papers and discussions. The deceased was the senior Magistrate and Alderman of the borough, of which he was Mayor in 1858 and 1869. His death was comparatively sudden; he having been in active public service up till a fortnight ago.

Death of Mr. Robert O. White.—The Directors of the South Metropolitan Gas Company lost a colleague on Saturday last, by the death, at his residence in Cromwell Road, of Mr. Robert Owen White, who had been a member of the Board from the date of the amalgamation of the Company with the Phœnix Company about thirteen years ago, having for some years previously been a Director of the latter Company. He was at one time a partner in the firm of Messrs. Bazley and White, cement manufacturers; and he was on the Boards of the Capital and Counties Bank, Limited, the Employers' Liability Assurance Corporation, Limited, and the London Life Association. He was also a Justice of the Peace. He had been very unwell since May last—his illness being caused by a shock received at the death of his wife; but nothing serious was apprehended until a few days before he died. We believe he succumbed to some form of lung disease.

Spring Foundations for Gas and Steam Engines.—A correspondent of *Industries* recently referred to the great difficulty experienced in fixing gas, and even steam engines, so that the sound will not be carried through the earth to neighbouring houses, and cause annoyance. He pointed out that, in putting down a gas-engine, the plan usually followed is to fix the engine as firmly as practicable to a large and solid foundation, so that any movement should be as slight as possible; but this means facilitating the communication of the vibration to the earth. He thought an exactly opposite course should be pursued; and that the engine should be so arranged that it could not communicate any appreciable vibration to the ground. He considered the simplest way of effecting this would be to mount the engine on springs. If, as is generally the case, it had a strong bed-plate, it might rest on a dozen springs, and then practically no shaking would be communicated. The objection that, under such circumstances, the engine would shake itself to pieces, the writer thought could be easily disposed of, but that it would not do so would have to be proved.

The Use of Coal Gas for Ventilating Sewers.—Our readers are aware that some trouble has been experienced in Richmond with the sewer-gas destructors erected there, owing to a fear that the flame used for burning the noxious emanations might pass back into the sewer, and cause the explosion of any coal gas that had accumulated there. It has been proposed to remove this danger by placing two sheets of wire gauze between the sewer and the gas-flame, on the principle of the Davy lamp. The remedy will, no doubt, be effectual. This, however, is not the point. It seems that the whole arrangement is not new; for we are reminded that many years ago the late Mr. James Sharp, Manager of the Southampton Gas-Works (who, it may be parenthetically remarked was one of the first to advocate cooking by gas), devised a cast-iron ventilating shaft, at the bottom of which a mixture of coal gas and atmospheric air, with air from the sewer, was to be burnt through wire gauze, on the principle above referred to, so as to prevent explosions. The inside of the shaft round the gas-flame was lined with a bad conductor of heat; and the gauze was made of a metal which would not be affected by the foul air from the sewer. It is curious that, though the advisability of destroying sewer gases in this safe and comparatively inexpensive way was urged upon the notice of sanitary authorities years ago, they could not be prevailed upon to make a trial of it; and now that a similar arrangement has been adopted and found wanting in the element of safety, it is proposed to perfect it by introducing as something new what was a constituent part of its despised predecessor. In more than one way, therefore, Mr. Sharp was before his time.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 873.)

THERE is scarcely any change to be observed in the general position of the Stock Markets from that which they occupied a week ago. Business has been somewhat restricted, below what one might call an average for the time; and the impediment has been fostered by fogs and ceremonies—the weather and the Lord Mayor's Show. The uncertainty felt in the Money Market has been the chief factor to keep things quiet; and even now no one seems able to forecast what or when will be the next material demand for gold. However, in spite of restriction and suspense, prices have not suffered; but rather the other way. There is ample money to meet all the probable requirements of the settlement; and, unless an unexpected run should set in from Continental quarters, there is no likelihood of any advance in rates this week. The Gas Market partakes of the general characteristics; being quiet and steady, with a disposition towards improving values wherever any change at all is perceptible. In Gaslights, the "A" has been comparatively but little dealt in; and prices ranging fractionally a trifle above and below 219 were about the daily standard. Dealings in the secured issues were rather more frequent, and at firm figures, especially for the debenture issues. But the only variation in quoted values was an advance of 1 in the "C," "D," and "E" 10 per cent. preferences. South Metropolitans were rather active and improving; but the only change was a rise of 1 in the "C," which was by no means too liberal an advance. Commercials were steady and unchanged. There was scarcely a single operation in all the Suburban and Provincial undertakings; and there is nothing to note in connection with them. The Continental Companies received their fair share of attention; and they are all firm at previous rates. Of the South American group, Buenos Ayres debentures are up 1; thus touching a premium once more, aided by the evident symptoms of general improvement in financial affairs in Argentina, and specially by the reassuring, but not unduly elated, report of the Directors just issued. There is also a better tendency among the Indians—Oriental changing hands at a rather better price; while partly-paid Bombays are asking ¼ more. None of the rest exhibit any feature. There is less business doing in Water; stock is scarce; and nothing can be got, except by giving more money for it.

The daily operations were: Gas opened firm on Monday, but remained very quiet all day. The tendency was decidedly favourable—Gaslight "C," "D," and "E" improving 1; South Metropolitan "C," 1; and Bombay new, ¼. Tuesday was very quiet and featureless; and nothing in Gas moved at all; but Kent Water rose 4. On Wednesday, there was considerable increase in activity over the preceding day, and prices were good all round; but the only change in quotation was an advance of 1 in Buenos Ayres debenture. Water continued rising, with an advance of 1½ in New River debenture and in Southwark "D"; and 1 in Grand Junction. Thursday was fair and steady; and nothing moved. On Friday, Gas continued unchanged; but Water still rose. Kent gained 2; and Chelsea, Lambeth, and West Middlesex, 1 each. Saturday was the usual quiet day; and the only change of quotation was an advance of 5 by buyers of New River.

ELECTRIC LIGHTING MEMORANDA.

Dr. Robinson on the Electric Lighting of Shoreditch Parish—The Cambridge Electric Lighting Undertaking—Cheap Daylight Service in St. Pancras.

THE Vestry of the Parish of St. Leonard, Shoreditch, have a Clerk who is a Solicitor and Doctor of Laws; and accordingly they did not deem it necessary to go farther for assistance in coming to a decision as to what should be done for the parish in the matter of electric lighting, but instructed Dr. Robinson to obtain information and report upon the subject generally. This he has done; the result being embodied in a pamphlet which can be had on application at the Vestry Offices for the modest fee of sixpence. We give publicity to this fact, feeling that a presumably well-considered report, emanating from such an authority as Dr. Robinson may be reasonably considered to be, ought to prove useful far beyond the populous local government area which commands the author's services. Dr. Robinson undertook his work with a proper sense of its gravity, as evidenced by his statement in the opening paragraph of his report, that the question before the Vestry is "probably the most important" that this body has had to consider since its incorporation in 1855. He then proceeds to give what he calls some "general facts on the history and present position of electric lighting." There is a good deal that might be criticized in Dr. Robinson's "history," as well as in his statements respecting the actual position of central station electric lighting. But, nevertheless, he has brought together a mass of information that, when handled with proper caution, is calculated to be of very considerable value. Dr. Robinson's own critical faculty is not highly developed; and, especially when dealing with engineering questions, he allows his chosen witnesses

to carry him with them in a way that would be fatal to his case if it were tested by cross-examination. When it is said that he accepts everything that Mr. W. H. Preece and even Mr. Robert Hammond have to say respecting the cost of electricity, it is unnecessary to offer any further comments on this head. In the end, Dr. Robinson very prudently recommends that, before the Vestry commit themselves to anything, they should take the advice of "a practical consulting engineer experienced in electric lighting, and independent of any special system or company." If such a man can be had, the Vestry could do no better than employ him. The difficulty is that while there is no lack of competent and honourable consulting electricians, the nature of the systems of supply which any one of them will recommend can usually be predicted as soon as his name is mentioned.

In a recent number of *Engineering*, a very comprehensive illustrated account was given of the works of the Cambridge Electric Supply Company, who are working under a special arrangement with the Corporation. The latter have entrusted the execution of their Provisional Order to Messrs. C. A. Parsons and Co., of Newcastle-upon-Tyne, whose engineering speciality is the steam-turbine, from which so much has been expected. The licensees formed a Company under the chairmanship of Mr. Finch, an Honorary Fellow of Queen's College; so that if there is anything in the benevolent supervision of the scientific University, this Cambridge undertaking ought to do things well, and prosper accordingly. As might be expected, the generating plant presents several novel features, the value of which can be shown only by experience. Lancashire boilers are used, with economizers; and superheated steam is delivered to condensing steam-turbine alternators, each designed for an output of 120 units per hour. Every unit of this generating plant is independent of the others; the compound steam-turbines working with multiple expansion from the boiler pressure of 140 lbs. down to the condenser pressure of 1 lb. absolute, and at a speed of 4800 revolutions per minute. The electrical efficiency of the dynamos, which are two-pole alternators coupled directly to the turbines, is 97½ per cent.; so that there is no reason to describe this part of the plant as "in its infancy." The steam-turbines were not adopted for this plant until after exhaustive tests by Professor Ewing, F.R.S., who holds the Chair of Engineering in the Cambridge University. These tests show that instead of the turbines being wasteful of steam, as was generally supposed, they are actually superior in this respect to most engines; and, at the light loads which are the rule in central lighting stations, they exhibit a remarkable economy. The text of Professor Ewing's report is given by our contemporary; and it is a valuable treatise on the steam-turbine in its present form. It establishes the fact that by this system electricity can be generated at an expenditure of 28 lbs. of steam per unit, or slightly less than 21 lbs. per electrical horse-power-hour. This is equivalent to 15·7 lbs. of feed water per "indicated" horse-power-hour, as it would be stated in respect of ordinary engine performance. Even better results are expected.

An account is given in the *Electrical Review* of the arrangements adopted by the St. Pancras Electric Lighting Committee for carrying out the cheap daylight service, at 3d. per unit, recommended by their Electrical Engineer (Professor Robinson). The idea is to create a demand for electricity for power purposes in competition with gas-engines; and it is recognized that this can only be done by selling it at a discount of 50 per cent. upon the ordinary charge for the lighting service. The object, of course, is to improve the "load" on the generating plant by giving it something to do during the daytime. As our contemporary puts it: "It is clear that, whatever be the details of the apparatus used for controlling the supply, the governing conditions are, firstly, that the supply given under the rebate should only be available during the hours of light load on the system; secondly, that if such supply be desired after hours of light load, it should still be available, but charged for at the general price per unit ruling in the district; thirdly, the means by which such transition is made must be automatic, cheap in first cost, and work practically without attention, as the profit on such supply would not allow of elaborate means of attaining the desired end; fourthly, and lastly, in cases where the lighting is electric, the supply for lighting purposes must all be charged at full price, whatever may be the case with the special supply given for power purposes." It is remarked that, at first sight, the problem would appear to be hardly worth the solving; and in this view we are disposed to rest. However, the thing has been done by the Resident Engineer (Mr. Baron), whose ingenuity is deserving of all praise, whatever may be the commercial results of the experiment. It now only remains for the users of electro-motors to come forward in sufficient numbers to justify the Vestry in bestowing so much care in supplying their hypothetical requirements.

Grant to the Royal Institution.—The Goldsmiths' Company have made a grant of £1000 to the Royal Institution, "for the continuation and development of the valuable original research which the society are engaged in carrying on; and especially for the prosecution of investigations on the properties of matter at temperatures approaching that of the zero of absolute temperature."

THE PROBLEM OF THE ARTISAN'S DWELLING.

When, a month ago, we offered a suggestion in these columns for grappling with the house-warming problem presented by the growth of the "flat" system in the best residential and business parts of London and other large towns, we confined our remarks upon this topic to what is called the better class of new house property. It will perhaps be necessary to return to this branch of the general question at some future time; for the present, it is desirable to consider an aspect of the problem which was hardly so much as incidentally referred to in the former essay. We allude to the condition, as regards warming and cooking, of the class of domiciles known as improved artisans' dwellings, which may be generically described as consisting of large and lofty blocks subdivided into tenements of one, two, or three rooms. If London and other wealthy centres of population present an increasing number of examples of residential and business "flats," much more do they exhibit the progress of the movement which is identified with the name of Peabody. Wherever street improvements in the more densely-populated quarters of London have cleared away the old "rookeries," and wherever the dwarfed and dingy dens that have housed the last three or four generations of labouring townspeople are pulled down in despairing acknowledgment of the impossibility of patching them up any more, there arise towering piles of "improved" industrial habitations marked by the "common stair" and the asphalted courtyard to which the Peabody executors first accustomed the gaze of the wayfarer in London, and which serve with the railway and the tram to differentiate the third-class London of to-day from the town of which Dickens has preserved for us so many vivid pictures.

One of the very latest illustrations of what organized effort can effect in changing the face and even altering the lie of the land in an old town district is Rosebery Avenue—a long and promising thoroughfare that has been recently cut by the County Council through the teeming neighbourhood lying between Gray's Inn Road and Clerkenwell. The omnibus route from Pimlico to Islington used to thread a sinuous course through small, miserable streets and short cuts from the then congested "Lane," down into what was the Fleet Valley, and up the grimy height called Mount Pleasant, before attaining the region which perpetuates the memory of Sir Hugh Myddelton and his New River water enterprise. Now, from the widened Gray's Inn Road, itself bordered by block after block of new industrial dwellings, erections of the same character are stretching all the way northward; and soon the unwonted openness that the locality owes to the new highway will be lost by reason of the huge barrack-like structures that will as effectually shut out the sun and air from the roadway as if they were so many Manchester cotton-mills. There will still, of course, be the fundamental difference between Manchester and Clerkenwell, that in the latter the people will live in the tall buildings, instead of merely working in them and herding in their shade, as in Ancoats; but, to a very great extent, the effect upon the aspect of the neighbourhood will be the same.

It is impossible to deny that public money is well spent in piercing the "slums" with main arteries for traffic and free circulation like Rosebery Avenue. When the Romans came to Britain and found the savagery of the aborigines fostered and protected by their dense forests and their impassable morasses, their rule for civilizing the country was summed up in their road-making. So to-day, when the improvement of a congested and neglected town district is in question, the first and the indispensable thing to do is to open it up with a good thoroughfare. Also, it can hardly be denied that the so-called improved artisan's dwelling is, on the whole, worthy of the appellation. Testimony upon this head is not unanimous, as it must be upon the value of good roads; because there is much to be said, upon general principles, against the concentration of a labouring population in habitations which approach the barrack type. The housing of a population like that of London, however, is a question of what is least objectionable rather than of what is ideally desirable. No one who follows the line of a "slum" clearing before the new frontages have been built upon, and who is therefore enabled to look at the backs of the old hovels, can question the superiority for all practical purposes of the style of house-building that is superseding them. And the right sanitary way to judge of a house, of any class, is to look at it from the back.

So we have to come to the conclusion that the improved artisan's dwelling is the type of the home which the town labourer will have to be content with in the future, whenever circumstances prevent his travelling to the suburbs for a residence, which, again, has its own disadvantages. Avenues like that called after the Earl of Rosebery, will penetrate the dingiest town areas, letting for a time an unwonted supply of light and air into places where every sort and degree of physical and moral darkness and filth have been established for generations. But after awhile—and this is our special point—the frontages will be blocked, in more than one sense of the word, by barrack-like structures harbouring human beings as thick as bees in a hive; and over the whole neighbourhood a gloom like that of the city of Dis will reimpose itself.

The reason for this is plain enough, and may be felt, rather than seen, by anyone who cares to spend time, in such weather as we had last week, in some neighbourhood where these industrial buildings already preponderate. Last week was a season of both general and partial fogs. During a general fog, of course, it is impossible to discriminate between one affected district and another. As an Irishman might put it, some parts might be worse than others, but none are better. Partial fogs, on the contrary, are capital indicators of the absence of air circulation. Now, as a matter of fact, there were days last week when London thoroughfares running east and west were fairly clear, and when out of the river valley it was possible to see dimly something of a blue sky far overhead. Streets running north and south, however, especially the narrower ones, held the fog from dawn to dark; and the regions of the industrial dwellings seemed to draw it like a sponge. There was simply no circulation of air through the narrow alleys and deep courtyards, where the children played in gloom too familiar to attract notice from them or the older habitants.

This state of things is also aided largely by, if indeed it cannot be said to be mainly due to, the multiplicity of smoky fires inseparable from these improved industrial dwellings, where every tenement has its little range for cooking as well as heating. The late John Bright once attracted the sympathetic attention of his countrymen by his statement of the case of that large proportion of the community which lives in one room. If memory serves us rightly, he spoke of a town where 60 per cent of the population had but a single room to dwell in; and he dilated upon the aspect which political and social questions must present to people so situated. It may be argued that having to live in one room does not necessarily imply unendurable hardship upon a person, or even upon a limited family, provided that the room is large enough, well fitted, and in good repair. This is precisely what the new industrial dwellings supply to their renters—sound, comfortable housing, whether of one, two, or three rooms, according as necessity and circumstances prescribe. For the present purpose, we prefer to enlarge John Bright's reference to the people of one room, and embrace the circumstances of the families that, whether they have possession of one room, or two, or three, in an improved industrial dwelling, agree in the circumstance of having no sitting-room distinct from their kitchen. This classification is a good one, inasmuch as it marks off the circumstances of the town residents dealt with in our previous article, and narrows the view of the smoke problem which we have now to submit to our readers.

The present question is, therefore, what can be done for the people who live in industrial dwellings, and who now contribute to enwrap their homes in black fogs, simply through having to keep their kitchen fires going? Unless there is some cure for this evil, the last state of the atmosphere of those neighbourhoods given over to improved artisans' flats will be worse than during the "slum" period, owing to the greater number of smoking flues due to the piling of kitchen upon kitchen to the height of seven or eight storeys. Yet the problem has only to be stated to show how difficult it is. These tenements do not want warming. With the exception of a very few in bedrooms appropriated to the sick, all the fires in daily use are needed for cooking, and are therefore kept going all day long, winter and summer—smoking abnormally, of course, most of the time, seeing that they are only just "kept in" when cooking is not actually in progress. It is a melancholy sight, to the ardent sanitarian, to see cluster after cluster, row upon row, of chimneys, rising above the flat roofs of the newest of these industrial tenements; for he recognizes in this neglected, hopeless particular, one of the chief, albeit not popularly noticed, sources of weakness in this system of housing the working-class town population.

These people need their little kitchen fires, and must have them, whatever smoke abatement enthusiasts may say; and they must burn coal, because coke is not lively enough, even if the exaggerated length of the flues in all but the upper tiers of apartments would allow it to be safely used. The bunker of coal stands beside the small kitchener. It holds a sack or two, and represents the Individualism of the respectable renter, as contrasted with the Socialistic fire of the common kitchen of the lodging-house. The black, heavy, smudgy fuel smoulders in the grate all day; but it can be poked into liveliness for the tea-kettle, when the time comes. Is there any substitute for it? What can gas do in the circumstances? It seems a mockery to call gas the poor man's friend unless it is capable of helping the industrious artisan in the home which the necessities of town life force upon him. How many occupants of industrial dwellings have their own gas-meter, automatic delivery or otherwise, and add to their own comfort while refraining, if only during the summer time, from contributing to the smoke-pall which overhangs their place of abode?

This is a grave matter, and one that deserves instant attention. It is not to be supposed that gas can supplant the homely and handy fire in the artisan's kitchen during the chilly days upon which we are now entering; but it can go a long way in this direction, if properly managed. Otherwise, if the renters of artisan's tenements are left to their own devices, and to the mercies of the coal and mineral oil dealers, the new and improved dwellings may be freer from risk of zymotic contagion than the slums they replace—they may even help in the formation and preservation of decent habits and good practical morality of character—but they will tend to deepen and render more permanent the smoke-cloud that steals so much of the brightness out of town life. We should like to take anybody who might be disposed to underrate the value of this last consideration into certain purlieus of this great Metropolis, in some such dull weather as will characterize the majority of the days that must be looked forward to betwixt now and next May. We would merely prop him against a high railing, and bid him listen to the mysterious sounds that come from out the gloom before him, until his eyes grow accustomed to the place, and he is able to distinguish the "young barbarians" at play in a well-like court round their best friend, the common lamp-post. If this sight did not spur our sceptic with the desire to give these poor people all the gas they would like, at home and abroad, together with a strong animosity against the prevailing darkness, and all that induces and aggravates it, then that man can have no capacity for work-a-day, simple charity, and is beneath argument.

Institution of Civil Engineers.—The opening meeting of this Institution for the present session took place last Tuesday, when the President (Mr. Harrison Hayter) delivered his Inaugural Address, in which he considered some engineering works of importance that will possibly have to be undertaken by British engineers in the not distant future.

Brown's Directory of American Gas Companies.—We have received from the *Progressive Age* Press, New York, "Brown's Directory of American Gas Companies and Gas Statistics" for the present year—the sixth of publication. In addition to the particulars comprised in the title, the volume contains the names of the officers and members of the several American Gas Associations, and tabulated statistics in regard to coal and petroleum. An interesting feature is a list of cities in which reductions in the price of gas have taken place during the past ten years. The whole forms a useful book of reference.

Death of Mr. Maskell W. Peace.—Mr. Maskell William Peace, one of the best-known men in the coal trade of the kingdom, and whose books on mining law are accepted as standing authorities, died at his Southport residence last Wednesday night. He had not been well for some time, and should have sailed for Egypt on Thursday. He was Secretary of the Mining Association of Great Britain, also of the Lancashire Coal-owners' Association, and of the Wigan Coal and Iron Company. He was legal adviser to several mining societies and companies, and the mainstay of the Wigan Mining Institute. He was in his 58th year.

The Damage to The Gaslight and Coke Company's Mains by the Fire on the Underground Railway.—An action of considerable importance, in which The Gaslight and Coke Company are plaintiffs and the Metropolitan Railway Company are defendants, was commenced in the Queen's Bench Division of the High Court of Justice last Friday, before Mr. Justice Wills, sitting without a jury. It was originally brought to recover damages occasioned to the Gas Company's mains crossing Vine Street Bridge, Clerkenwell, by the fire which occurred on the railway underneath on Sept. 19, 1890, particulars of which were given in the JOURNAL at the time. A sum of £2250 had, however, been paid into Court by the defendants, to meet this claim; and the case is being fought with regard to a further claim put forward by the plaintiffs to have the agreement of 1885, under which one of the mains was laid, cancelled, on the ground that it had been entered into in ignorance of the existence of certain statutory provisions in their favour. The Attorney-General (Sir C. Russell, Q.C., M.P.), Sir Horace Davey, Q.C., and Mr. Danckwerts, appeared for the plaintiffs; Sir R. E. Webster, Q.C., M.P., Mr. Moulton, Q.C., and Mr. F. Mellor represented the defendants.

Tar and other Gas Residuals in the United States.—Some time ago, Mr. E. G. Cowdery, Engineer of the Milwaukee Gas Company, applied to the Editor of the *American Gaslight Journal* for information as to how much coal tar was produced annually in the United States, and how much was imported. His application was duly attended to, and answered. He has since written to the above-named publication to the effect that, after investigating the matter as far as he has been able, he is obliged to accept the estimate of Mr. C. H. Welch, the Secretary of the Athens (Ohio) Gas Company, in relation to the coal tar produced in the States, as 700,000 barrels. Mr. Cowdery learned from the Treasury Department, at Washington, that there was imported into the States, for the year ending June 30 last, a quantity of tar and pitch equal to 117,056 barrels. This appears to him to be a small amount; and it would not, he says, seem that it was large enough to depreciate the value of that material in the United States from $5 to about $2 or $2·50. He also ascertained from the Department that during the same year there were imported 9,906,590 lbs. of sulphate of ammonia, and something like 9000 barrels of benzol, dead oil, and other products from the distillation of tar. While thanking Mr. Cowdery for his figures, which are of much interest, our contemporary expresses the opinion that they maintain that gentleman's deduction, that an import of tar and pitch amounting to (say) 16½ per cent. of the home production does not completely account for a decrease of 50 per cent. in the all-round price of the commodity.

NOTES.

Flanged Plates v. Angle-Irons.

The practice of employing flanged plates in structural iron-work having recently grown general, to the supercession of the older style of construction involving the use of separate angle-irons riveted to the edges of plates, a question arose as to the comparative stiffness of the two methods of construction. A simple way of testing the point was devised by Messrs. A. and J. Inglis, the well-known Clyde shipbuilders, who had adopted flanging machinery made by Messrs. Hugh Smith and Son, of Possil Works. They build up two strips to represent stiffened plate work, with the difference that while one piece of plating was stiffened by a separate angle-iron, the other depended entirely for stiffening upon the flange of the plate itself. These two strips were set up vertically opposite one another, rigidly connected at top and bottom, and then equally strained crosswise by being forced apart by a screw-jack. The result was such as to leave no doubt respecting the preferable method of construction; the angle-iron stiffener yielding sixteen times more than the flanged one. This does not mean, of course, that the one method of stiffening is sixteen times as strong as the other, because it is obvious that, when one piece of plating began to bend, it would go on doing so for very little additional pressure. The test only means that one style of construction is stiffer than the other; but it does not show how much.

Waterproof and Fireproof Cement.

Herr Alwin Nieske, of Altherzberg, suggests a method for the preparation of an absolutely waterproof cement, consisting in the addition to ordinary cement of acetate or palmitate of alumina. By further adding chromate of magnesia to this mixture, the cement is made refractory as well as moisture-repelling. The idea is that cement of this character would be advantageons for use in very damp situations, or for tanks, &c., underground. The proportion of palmitate of alumina to be employed will vary according to circumstances, the nature of the mortar or cement, and the character of the work to be done; but 10 per cent. of the palmitate would be a good proportion for any kind of hydraulic mortar. If the cement is needed to resist humidity, and be at the same time refractory to fire, a mixture is made in about equal parts of the cement mortar with the palmitate and a chromic magnesia prepared with oxide of chromium, 32 to 42 parts; alumina, 18 to 22 parts; magnesia, 18 to 20 parts. The mixture of these earths, wetted with water, is formed into briquettes, which are calcined, pulverized, and kept ready for use.

The Carbonic Acid in Air.

Dr. Augustus H. Gill has contributed to the *Journal of Analytical and Applied Chemistry* some observations upon the examination of air for carbonic acid, by the method of Pettenkofer, which consists in bringing a large known volume of the air in contact with standard barium hydrate. The bottles employed by Dr. Gill in practising this method are ordinary green glass gallon or two-gallon bottles, fitted in a partitioned basket for convenience of carriage. The bottles must be clean and dry when used for taking a sample of air; and they are closed with rubber stoppers through which passes a glass tube, closed with a rubber nipple. These stoppers have to be thoroughly digested with caustic potash, and washed. The air is drawn into the bottles by means of a fan or a pair of bellows, working as quietly as possible so as to avoid disturbing the atmosphere. To test the sample, 50 cubic centimetres of the standard barium hydrate are run rapidly into the bottle; and the interior surface is wetted with it—the contents being shaken up at intervals for an hour. The liquid is then drained off and titrated with standard sulphuric acid—using rosolic acid as an indicator. The difference between the number of cubic centimetres of standard acid required to neutralize the amount of barium hydrate before and after absorption, gives the number of milligrammes of carbonic acid present in the air. By this method the air in a well-ventilated lecture-room 15 feet high, having a capacity of 24,000 cubic feet, and supplied with 185,000 cubic feet of fresh air per hour from three flues, was found to increase its proportion of carbonic acid from about 4 parts to between 11 and 12 parts in 10,000, within one hour; 225 students being present. In the same way, the air of an ordinary theatre was found to contain carbonic acid ranging from 39·13 parts in 10,000 on the floor, to 48·94 parts in 10,000 in the gallery.

Lysol as a Disinfectant.

Attention having been drawn by the recent cholera "scare" to the popularity of carbolic acid as a disinfectant, notice is being taken in medical circles of the even superior advantages for many purposes of the cresols as disinfectants. It was discovered that crude carbolic acid made soluble by the action of sulphuric acid surpassed in germicidal power an equally strong solution of pure phenol, besides which creolin, although free from carbolic acid, was proved to be of unmistakably superior disinfecting activity to the latter. Being insoluble in water, however, these cresols were neglected until the idea was hit upon of combining them with resin soap. Although very efficacious, these preparations were only emulsions; and it remained for the cresols to be made soluble, as now in the form of lysol, in order that what can be called the ideal soluble disinfectant should be made generally available. Lysol is produced by dissolving in fat, and subsequently saponifying, with the addition of alcohol, the fraction of tar oil which boils between 190° and 200° Cent. It is a brown, oily-looking, clear liquid, with a feebly aromatic creosote-like odour. It contains 50 per cent. of cresols; and it is miscible with water to a clear, saponaceous, frothing fluid. It shows turbidity when mixed with hard water; but its disinfectant quality is not impaired thereby. It acts to all intents and purposes as a soap; and it is admirably adapted for use in surgical operations. According to German testimony, lysol is one of the most precious products of coal tar which chemistry has given to the service of mankind.

TECHNICAL RECORD.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The last Meeting for the present year of this Association was held on Thursday, at the Holborn Restaurant—the PRESIDENT (Mr. A. Dougall, of Tunbridge Wells) in the chair. There was rather a smaller attendance of members than usual.

The minutes of the meeting held at Tunbridge Wells in May having been confirmed, the members proceeded to elect

OFFICE-BEARERS FOR 1893.

Mr. R. MORTON (London) said he had been requested to propose a gentleman to fill the office of President, and perhaps he was in a position to speak of that gentleman as no one else present could. He referred to Mr. C. C. Carpenter, of the Vauxhall works of the South Metropolitan Gas Company. He knew Mr. Carpenter to be a very efficient gas manager and gas maker; and he knew that he was also efficient in duties such as would devolve upon him as President of the Association. They were all acquainted with Mr. Carpenter; and he did not think he need say anything more in support of the proposition that he be elected President for the ensuing year.

Mr. S. W. DURKIN (Southampton) seconded the motion, which was carried amid applause.

Mr. CARPENTER said he could assure the members that he was very grateful to them for the manner in which they had received his name as the President during the coming year. When he entered the Association six years ago, he knew very few of the members; but now he believed he could include practically the whole of them in the circle of his friends. He had rather difficult Presidents to follow; but he would endeavour to tread in their footsteps, and conduct the Association in something like the manner it had been hitherto.

The PRESIDENT remarked that the next business was the election of Honorary Secretary and Treasurer. They had in Mr. Helps all those varied qualifications that went to make up a model Secretary. In addition to tact, he possessed that kind and genial manner so necessary to make things go smoothly in an Association like theirs. He had therefore much pleasure in moving his reappointment.

Mr. J. L. CHAPMAN (Harrow) seconded the motion, which was heartily agreed to.

Mr. HELPS having acknowledged this proof of the continued confidence of the members in him,

Mr. A. F. BROWNE (Rotherhithe) moved the appointment of Messrs. W. A. Valon, of Ramsgate, and J. Tysoe, of East Greenwich, to serve on the Committee in place of Messrs. Corbet Woodall and Durkin, who retired by rotation.

Mr. R. HERRING (Dover) seconded the motion, which was unanimously carried.

On the proposition of Mr. J. SOMERVILLE (London), seconded by Mr. W. E. PRICE (Hampton), Messrs. W. H. H. Broadberry and C. E. Botley were elected Auditors of the Association.

NEW MEMBERS.

Messrs. W. B. Mimmack, of St. Mary Cray, and T. Jowett, of East Grinstead, were elected members of the Association.

Mr. C. C. CARPENTER (Vauxhall) then read the following paper on the subject of

PURIFICATION.

The growing importance of the question of efficient and economic purification will not be gainsaid, however much opinions may be divided as to the extent to which, in one particular, this process should be carried. It nevertheless seems not improbable that what are called "London conditions," as affecting the purity of its gas supply, will gradually be extended throughout the kingdom. Signs of this are already apparent, in that some of the largest corporation works which have hitherto enjoyed immunity therefrom are now struggling to master what has been aptly termed the "sulphur difficulty." A discussion of this subject, therefore, by the members of such an Association as this, cannot fail to be productive of good results, in increasing their knowledge of its present theory and practice, as well as by indicating in what direction improvement may be looked for. These considerations are, indeed, the only justification the author can offer in presenting a paper while his investigations were still far from complete.

Purification is generally understood as the process employed

for the removal from crude gas of the impurities remaining after it has been properly condensed and washed. These, as is well known, consist mainly of carbon dioxide, sulphuretted hydrogen, and carbon disulphide, associated with other compounds of sulphur which are not of great importance. As regards the two former, even in the early days of gas manufacture, when it and chemistry were not allied sciences in the sense they are now becoming, gas managers were fully alive to the disadvantages attending the presence of either in their finished product. With hydrate of lime and oxide of iron, their removal could be effected with certainty and ease; and if purification had ceased at this point, engineers would have been spared what has since developed into one of their greatest anxieties. But this was not to be; and the name of Dr. Letheby will probably endure among future generations of gas engineers, if for no other reason than as being one of the first to call that attention to the presence, in purified coal gas, of compounds of sulphur other than sulphuretted hydrogen, which resulted in that famous "leap in the dark," as the Gas Referees put it, the embodiment of the sulphur clauses in the Act of 1860. Certainly such a legacy may well be called a vexatious as well as a troublesome one, when it is remembered that, for more than thirty years, engineers and chemists alike have been endeavouring, and still with only incomplete success, to satisfy its conditions. It is therefore not to be wondered at that discussions on purification very generally resolve themselves into consideration of the most suitable means for extracting sulphur compounds.

The two methods of using lime for this purpose generally adopted are the rotation system, and what may be called the Beckton system, since it originated in the works of that name. As usually carried out the latter requires a series of at least eight purifiers worked in the following order: Two containing lime, for the removal of carbon dioxide; two containing oxide of iron, for the removal of sulphuretted hydrogen; two containing lime rendered foul by the bye-passing, when necessary, of the two previous boxes; and two catch vessels, for the removal of the remaining sulphuretted hydrogen. The carbonic acid vessels are changed as often as may be required to prevent this impurity passing forward into the sulphur boxes. The interposition of the oxide of iron vessels is for the purpose of keeping sulphuretted hydrogen out of these also, except when it is desired to make a sulphide, as the operation is called. These oxide vessels serve another purpose—that is, to absorb any oxygen which, as air, may have been drawn in with the crude gas; it being stated that its presence interferes with, or completely upsets, the effective working of the sulphur purifiers.

At first sight the system just described appears to be perfection, since each impurity is removed not only by successive steps, but in separate vessels—the carbon dioxide forming innocuous carbonate, and the sulphuretted hydrogen held by the two sets of oxide boxes being converted into free sulphur, while the sulphide vessels not only work a great number of months, but it has been proposed to extract the carbon disulphide from their spent material, with what success the author is unaware.

Simple as the process above described appears, yet on a large scale its satisfactory working is attended with difficulty. Not the least serious is the uncertainty of making an effective sulphide vessel, as well as the time occupied in the operation. Provided air be rigidly excluded, the author believes it is not possible to bring this about, under ordinary conditions, by passing into a vessel filled with slaked lime, gas charged with sulphuretted hydrogen, but in which no carbon dioxide is present. The lime combines indeed with the sulphuretted hydrogen; but the resultant compound is quite useless for absorbing carbon disulphide. It is greyish white in colour, and is hardly distinguishable in appearance from ordinary slaked lime. It possesses a very strong affinity for oxygen; and the heat evolved by its combination therewith is sufficient to char the wood grids on which it is carried. If, after this heating has taken place, the fouled material is returned to the purifier, it at once absorbs carbon disulphide. Preparing material in this manner is always attended with nuisance, and can only be resorted to in works which are not situate in populous or particular places. In any case, its life and duty are uncertain quantities.

Reverting again to the carbonate vessels, if all trace of carbon dioxide is to be kept out of the sulphide vessels, not two, but probably three or four, would be required, if the lime is to be thoroughly carbonated. As a set-off must, of course, be placed the fact that a larger quantity of sulphur is recoverable from the oxide used. Yet a system possessing the above disadvantages, and requiring at least eight, and perhaps ten, purifiers to a set to carry it out, cannot, apart from its uncertainties, be considered an ideal one.

The second method to be dealt with is the rotation system. For this a set of four vessels containing lime, and two oxide of iron, will be sufficient. Though not recommended, a centre-valve gives all the changes required by the former. This fact is of interest, as probably suggesting how the plan of using lime in this manner came to be tried—namely, by its substitution for oxide in the set of four boxes commonly used in the earlier days of gas lighting. The so-called air system of purification consists in using lime vessels in this way, with the addition of a certain percentage of air, drawn in and mixed with the gas by the partial vacuum existing on the retort side of the exhauster. Apart from the smaller number of purifiers required, purification conducted in this manner possesses several important advantages; not the least being the certainty of the process. The sulphur compounds on the outlet of the last vessel do not increase with a sudden jump, but gradually; thus giving ample time for re-charging the first vessel with clean lime previous to placing it last in the series, when, if (as should be the case) sulphuretted hydrogen is passing into it, the activity of the box begins at once. Another advantage is the synchronizing of the fall in the efficiency of the last vessel for sulphur compounds, with the saturation of the first for carbon dioxide. In other words, the elimination of carbon dioxide may be looked upon as the main duty of lime vessels worked in rotation; the absorption of sulphur compounds and sulphuretted hydrogen being a secondary, or rather a parallel, reaction.

The question then arises: Can such a system as has been described be carried on with certainty and regularity? The author believes that, under certain conditions, an answer in the affirmative may be given to it. Instead of admitting air in the usual way, the author introduces it into the fourth or third purifier in a rotation set. No oxydizing action therefore takes place antecedent (either in the first purifiers or earlier) to the point where the full effect of it is wanted—namely, in the purifier active for sulphur compounds. Used thus, 1 per cent. of air has been found sufficient to bring about therein the desired reactions regularly and reliably; the scrubber gas containing between 40 and 50 grains of sulphur compounds per 100 cubic feet.

Considerable misapprehension appears to exist as to the basis on which the air should be proportioned. This is quite independent of the quantity of sulphuretted hydrogen present, instead of requiring to be varied with it. What is wanted is, not to precipitate as much, but as little sulphur as possible in the lime boxes; all but what is necessary for absorption of carbon disulphide being passed forward into the oxide of iron. The air apparatus required is very simple, consisting of a combined engine and blower and a wet meter. The dial of this should be so arranged that rapid adjustment of quantities passed can be made; and a very good meter for this purpose is manufactured by Messrs. W. and B. Cowan. As an additional refinement, a small box containing slaked lime is added, through which the air is drawn and purified. Daily estimations of the work done by each purifier of the series have been made by the Harcourt colour test.

Particulars of Sulphur Purification Experiment.

Coals carbonized	27,747 tons
Gas made per ton	10,578 cubic feet
Lime used	924 yards
Coal carbonized per yard of lime used	30·03 tons
Sulphur compounds (Referees' test)—	
Summer maximum	12·20 grs.
Winter maximum	13·80 „
Average	9·56 grs. per 100 c. ft.
Superficial area of purifiers per million cubic feet of gas produced per diem—	
Maximum	324 sq. ft.
Minimum	243 „
Mean	302 square feet.

Cycle of Purifiers.

	Order of Working.	CS_2 Grains.	H_2S Grains.	CO_2 Per Cent.
A	Main inlet	35·7	345	·33
	No. 1 purifier	34·5	345	·23
	No. 2 „	32·3	270	·06
	No. 3 „	3·7	trace	trace
	No. 4 „	3·1	nil	nil
B	Main inlet	35·7	333	·40
	No. 1 purifier	34·3	333	·31
	No. 2 „	34·3	313	·16
	No. 3 „	5·6	7·4	·10
	No. 4 „	2·7	trace	nil
C	Main inlet	38·5	257	·41
	No. 1 purifier	38·5	333	·34
	No. 2 „	34·3	270	·22
	No. 3 „	12·5	161	·13
	No. 4 „	4·4	trace	nil
D	Main inlet	32·3	345	·39
	No. 1 purifier	32·3	357	·37
	No. 2 „	31·3	323	·17
	No. 3 „	20·9	222	trace
	No. 4 „	5·2	27·8	nil
E	Main inlet	34·5	345	·41
	No. 1 purifier	34·3	345	·40
	No. 2 „	33·4	333	·27
	No. 3 „	26·3	274	·05
	No. 4 „	6·3	74	trace
F	Main inlet	34·5	371	·40
	No. 2 purifier	35·7	357	·33
	No. 3 „	31·3	345	·06
	No. 4 „	9·2	151	trace
G	No. 2 „	35·7	—	—
	No. 3 „	33·3	—	—
	No. 4 „	9·5	—	—
	No. 1 „	5·0	nil	—
H	Main inlet	34·5	345	·39
	No. 2 purifier	35·7	345	·36
	No. 3 „	35·7	333	·20
	No. 4 „	16·4	185	·05
	No. 1 „	3·5	trace	nil

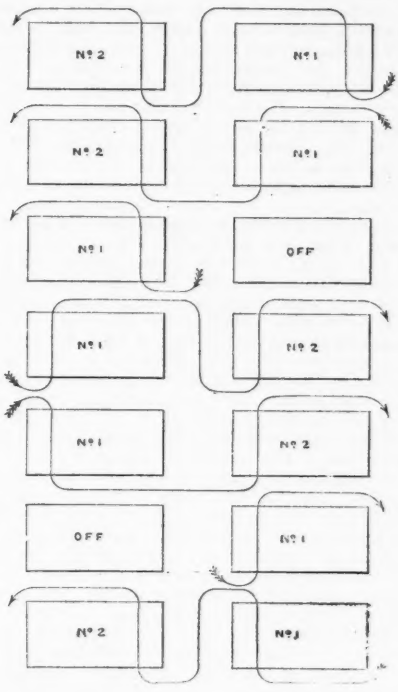
Note.—Each set of testings gives the average results of the day, except in the case of F and G, which are the figures before and after the change of purifier.

Referring to the second table, under the heading CS_2, the direct reading is in every case given, without adding the 7 or 8 grains stated as necessary to bring the results up to those indicated by the Referees' test. It has been found that, while those figures represent the proper amount when the sulphur impurities are high, they should be reduced by 2 or 3 grains when these are maintained below 10 or 11 grains, as shown by the Referees' test. Attention must also be directed to the testings for CO_2. These percentages are those found with the colour test, which, though it does not indicate nearly the total initial quantity, is useful for estimating smaller amounts, and as a delicate test for traces. Tested by means of the Hempel, or better still the Orsat apparatus, the carbon dioxide in the scrubbed gas averages about 1·5 per cent. The author cannot refrain from bearing testimony to the ease and accuracy with which the absorbable impurities in crude gas can be rapidly estimated volumetrically with this apparatus—the more so as he does not think its use for the purpose is known to most gas engineers. Great diversity of opinion exists as to the amount of air which may be used for the purpose of purification without detriment to the finished gas. Some experiments have indeed been made to determine the reduction in illuminating power due to mixing gas and air in varying proportions; but, since the oxygen of the latter is absorbed in its passage through the boxes, these experiments are of no use in settling the question.

Dr. Frankland has published the results of his investigations of the effect of nitrogen on the luminosity of ethylene. But these are of little value as evidence of the result of its admixture with coal gas; and as the author was unable to find any references dealing with the matter, he set to work to make experiments with a view to determine the question. For this purpose, gas was stored in a holder 14 ft. 6 in. in diameter, and holding about 2000 cubic feet—sufficient to secure its constant composition throughout a very large range of experiments. The photometer was a duplex one, made by Messrs. Sugg and Co., its peculiarity consisting in its having two complete sets of apparatus in connection with the bar, the standard burner of which could be instantly supplied from either set. The percentages of nitrogen with which it was desired to experiment, were too small to allow of their being measured direct through a meter; and to have made up each sample would have been not only a laborious task, but one attended with unsatisfactory conditions, since considerable time must have elapsed before one experiment could be followed by another. The following arrangement was therefore adopted: A 5-feet standard test holder was partly filled with nitrogen, evolved by gently heating in a water-bath, a mixture of chromate of potassium, nitrate of ammonia, and nitrite of sodium in solution; the gas being washed and purified. On analysis, it was found to be pure nitrogen. The holder was then lowered until ½ cubic foot remained, when its contents were made up to 5 feet by gas from the large store holder. The test holder contained, therefore, a 10 per cent. mixture of nitrogen with the standard gas. Between its outlet and the inlet of one of the photometer meters, was fixed an auxiliary clock meter. Through this the nitrogen mixture could be measured in rates giving any desired percentage; and then, mixing with the standard gas on the inlet to one of the photometer meters, passed on to the burner and consumed at the standard 5-feet rate. It was therefore easy to make in rapid succession a series of tests of diluted gas, alternately with standard gas; the same burner and the same standard being used in both cases. Unfortunately, several unlooked-for delays occurred in fitting up the experiment; but most vexatious of all, was the discovery of a serious error in the comparison standard, which at the last moment rendered its rejection and the substitution of candles imperative. With these, however, one set of experiments on a 1 per cent. mixture of nitrogen and gas was made; the difference found—burning the gas and the mixture at 5 feet per hour—being 16·2 and 16 candles respectively.

The author greatly regrets that he has been unable to obtain more data on this important subject in time for the present meeting; but he hopes to be able to publish, at no distant date, a full account of the results of his investigations, on the lines laid down. It is also hoped that the importance of this question of nitrogen dilution may be considered to justify the time occupied in its discussion, since it, and it alone, is the determining factor in oxygen *versus* air. Without laying too much stress upon the preliminary experiment recorded, it may fairly be suggested that it probably explains why some have considered nitrogen as a carrier of hydrocarbons, since it confirms the large-scale experience of its small depreciating effect.

In the foregoing paper, purification has been discussed from a chemical rather than an engineering standpoint. To include the latter, would make too great demands upon the time at the author's disposal; but he cannot turn from this division of his paper without making reference to one important particular, in which he ventures to think chemical should be considered with engineering requirements. Remembering how largely temperature determines the quality of chemical action, surely it is too much to hope that the complex changes occurring in the purification of coal gas will go on with equal regularity whether the thermometer is below freezing point or some 70° above. The final stage in purification is from the remaining sulphuretted hydrogen. In the author's works, the average amount of this impurity to be dealt with in the catch vessels, is about one-fifth of that present in the scrubbed gas. In this position, oxide of iron has hitherto been generally used; and its action is pretty well understood. Some time ago, the author devised an arrangement for utilizing, to a further extent than usual, the well-known advantages this material possesses, of not giving up any absorbed sulphur when foul gas is passed into it. Two purifiers were used as a set; and they were fitted with valves, so that the direction of the current of gas through each could be reversed at will. Calling these vessels 1 and 2, the cycle of their working is shown in the diagram. The arrangement was of the greatest utility when the number of purifiers was limited.



Instead of oxide of iron, Weldon mud is now coming rapidly to the front; and as it has been used on a large scale at Vauxhall, some particulars of its working may be of interest. The mud is the result of the treatment of chloride of manganese, made as a bye-product in the manufacture of bleaching powder, with lime and air by the Weldon process. Its introduction as a purifying agent, has been the result of the united labours of Dr. Hood and Mr. Gordon Salamon. The reaction occurring when sulphuretted hydrogen is passed into it, is similar to that with oxide of iron—sulphide of manganese and water being formed; in like manner, when exposed to air, oxidation takes place and sulphur is deposited. The charm of Weldon mud lies in its great affinity for sulphuretted hydrogen, which appears to be four or five times greater than that of bog oxide. At Vauxhall, two purifiers 30 feet by 34 feet, each containing 50 tons of mud, have wholly purified from the sulphuretted hydrogen leaving the lime purifiers 400 million feet of gas. The maximum make per day was 6 millions; so that the above result was effected with a purifier area of only 170 superficial feet per million feet of gas. No change has yet been made; and from an inspection of the material, it appears equal to another 400 millions before any is required. The author regrets that he is unable at present to give more complete statistics of its relative efficiency compared with oxide; but he thinks he has said enough to justify his belief that Weldon mud appears likely to largely displace it. Careful trials of the two materials are now being made side by side in two experimental purifiers, each six feet square; and the results will be published in due course.

In conclusion, the author would sum up the chief points he has endeavoured to bring out in the foregoing paper as follow

(1) That, of the two methods discussed for dealing with sulphur compounds, the rotation system worked in conjunction with a proper supply of air, is the more reliable and satisfactory.

(2) That this supply of air should be proportioned, having regard to the removal of the carbon disulphide, and *not* the sulphuretted hydrogen.

(3) That the reduction in illuminating power due to the presence of nitrogen is expressible in terms of its acting as a diluent only.

(4) That the method of using air proposed by the author, permits its fullest efficiency to be obtained; and that too, with boxes of relatively small area.

(5) That working with Weldon mud on a large scale shows that the extended use of this material is a matter which may be profitably considered by gas engineers.

Discussion.

The PRESIDENT observed that Mr. Carpenter had treated this old question of purification in a very lucid and exhaustive manner; and he had given to it a freshness that was very welcome. He hoped there would be a good discussion; and that members would freely relate their own experience on this important matter.

Mr. C. GANDON (Lower Sydenham) said the few remarks he should make would simply be for the purpose of opening the discussion, as he had nothing new to say. This subject of sulphur purification was a well-worn one. He recollected an esteemed member of the Association on one occasion saying that, if it were not for the wretched sulphur compounds, gas managers would pass a very happy life; and he was inclined to agree with him, for they had given him (Mr. Gandon) a great deal of trouble. Mr. Carpenter, in the commencement of his paper, gave Dr. Letheby the credit of having "invented" these sulphur compounds. He believed this was so—indeed, he had seen a letter written by Dr. Letheby (which was now in the possession of Mr. Magnus Ohren) in which he said that, if he had known the sulphur compounds were going to raise so much trouble among gas makers, he would never have invented them (laughter), and he was sorry he had done so. However, they now understood them better than they did some years ago. With regard to his own works, Mr. Watson knew more about what they were doing in the way of purification than he did himself; and he would be able to give the members some information. He believed they were pretty successful in keeping the sulphur compounds down within limits; but at what cost? He had no hesitation in saying that it was at least 1d. per 1000 cubic feet on the manufacture of gas. Whether or not "the game was worth the candle" he did not know; but, in his opinion, it was not. He did not believe that any consumer could distinguish between 20 and 30 grains of sulphur per 100 cubic feet. At Sydenham they were now practically purifying with lime. Oxide of iron was out of the question altogether; and they only used it for arresting any fugitive sulphuretted hydrogen from passing away. They started a pretty theory some years ago, which was to use oxide of iron first to take out the sulphuretted hydrogen, then lime to take out the carbonic acid, and then sulphide of calcium was brought to work to take out the sulphur compounds. This, however, would not answer; and the first oxide purifiers had little or nothing to do. He was speaking of his own experience; and he found they must get sulphuretted hydrogen into the sulphide of calcium purifiers—the purifiers must contain a certain amount of sulphuretted hydrogen in them, in order to get out the sulphur compounds. Mr. Carpenter had suggested a way of doing this; and he appeared to be working very satisfactorily, by the introduction of air, not at the first purifiers, but at the sulphide purifiers. As he (Mr. Gandon) had no experience of this method, he could not, of course, criticize it. There was no doubt, however, that a certain amount of air found its way in whether they wanted it or not; and he believed it had a beneficial effect. He was of opinion that a vast amount of trouble was expended and money wasted on sulphur purification; and although Mr. Carpenter said that, sooner or later, municipalities even would have to bow their heads to the demand for the reduction of the sulphur compounds, for his own part he should be glad if they were allowed free scope in the matter, and not be legally bound to any specified limit. He believed if it were so, gas managers would be better able to deal with the question than they were at present, because they dared not, under the existing restrictions, make experiments to get rid of the sulphur compounds, in case they turned out the wrong way.

Mr. T. MAY, jun. (Richmond), remarked that Mr. Carpenter had brought this subject before the members in such a fresh light that he did not think they would be able to adequately discuss it. Air purification to a certain extent was new; but the way in which the author of the paper passed his air in had brought about a different process altogether; and that, in his opinion, was the most interesting part of the paper. A good many of them used air; and, notwithstanding they were told it reduced the illuminating power, they continued to employ it. At Richmond they worked with four vessels; drawing in air at the usual place—at the inlet of the exhauster. A large proportion was used up in the first three vessels of the series in dealing with sulphuretted hydrogen; and they got an attenuated quantity in the fourth vessel, which would not be as active as air introduced into the last vessel. He thought they were indebted to Mr. Carpenter for pointing this out so clearly as he had done. As to the experiments with nitrogen, he should look forward with interest to his further investigations; and he might perhaps give the members the results in his address in February. He understood that Mr. Carpenter found 1 per cent. mixture of nitrogen only reduced the illuminating power 0·2 candle. Well, this was very much less than it would work out if they simply took the nitrogen as a diluent. He believed, with regard to this question of illuminating power, that most of them had been inclined to overlook the fact that their purifiers reached a very much higher temperature when using air. In his own case, the temperature was 15 per cent. higher with air than when it was shut off. The temperature had a great deal to do with the illuminating power. In winter, when the temperature had been low, they had had difficulty—using the same coal and working under the ordinary conditions—to obtain gas of the necessary illuminating power. As to Weldon mud, he observed that Mr. Carpenter had purified a large quantity of gas in the two purifiers; and he should like to know whether his experience had been that, as it absorbed such a large quantity of sulphur, it was inclined to throw back pressure. His own experience of oxide purifiers was that they had to be changed on account of back pressure, and not through being fouled.

Mr. J. C. WATSON (Lower Sydenham) did not think that he could say much on this question. The author of the paper had carried out practically the same system of purification as they had at Sydenham; but, instead of having four boxes, they used a greater number. They had six lime purifiers in each series; and by the method of rotation, the lime was fairly carbonated before it was changed. After the carbonic acid purifiers, came two sulphide boxes. With regard to the question of excessive quantities of sulphur, this arose from one of two causes—one was an excess of sulphuretted hydrogen going into the sulphide box, or an excess of carbonic acid. If one could get down the excess of sulphuretted hydrogen through the carbonic acid boxes, they could make the life of the sulphide boxes practically about six months; but if they had an excess of sulphuretted hydrogen or of carbonic acid, they found the sulphide boxes did not last so long. He should estimate that the amount of air going into their purifiers was about 1·5 per cent.

Mr. FRANK LIVESEY (London) said, in criticizing the paper, the first thing that struck him was the relative merits of the two systems of purification—the rotation, and that which had different boxes for different impurities. He had not had much experience with the Beckton system, as Mr. Carpenter had designated it; but he had had a little, and it was in this way: The usual carbonic acid boxes, then sulphide boxes, and catch boxes at the last. This was tried at the Greenwich station of the South Metropolitan Gas Company; and it was on the anti-dip system, so that no air was drawn into the gas. The sulphide boxes always had to be "made." The lime had to be taken out and left a few hours; and he thought it was watered well until it heated. It was then put back again, and was in a condition to take out the sulphur compounds. He considered the system was very unsatisfactory; and as it ranged the highest in point of cost for purification in all the six works of the Company, they decided to give it up, and try the rotation system. The purifiers were therefore altered; and the rotation system was tried. However, it did not answer until air was pumped in; and, of course, in that case it must be pumped in, as there was no vacuum at all. It was now giving very good results indeed. He could not quite agree with Mr. Watson that he was working on the same lines as Mr. Carpenter; it seemed to him that he was working altogether differently. The element of success of the rotation system was this—that, supposing they had four boxes, they must have the sulphuretted hydrogen ahead of the carbonic acid; that was to say, supposing they had the carbonic acid passing through the first and second purifiers, then they ought to have the sulphuretted hydrogen slowly passing through the third. If they had these conditions, and a certain amount of air was going in, the sulphur compounds could be reduced to any desired extent. But if the carbonic acid ran neck and neck with the sulphuretted hydrogen—the two going on together—they must sulphide the boxes before the carbonic acid was allowed to go in. A little carbonic acid with the rotation system did no harm if they had plenty of sulphuretted hydrogen. He thought Mr. Carpenter's system of admitting air the right one; and he could not see the use of letting air in the lime boxes when they were carbonated. At one of their works, whenever they had a low temperature, the purifiers got out of order almost directly. About a fortnight ago, they had a case like this; and then the only thing they could do was to take the lime out, heat it, and then put it back again, when it did its work. If they took a portion of lime and put pure sulphuretted hydrogen into it, it would be found that, if they tried to take out sulphur by its means, it would not be successful. He had tried it experimentally; and it reduced the sulphur very slightly indeed, and made the material a dark green colour. With regard to Weldon mud, Mr. Carpenter said he had considered its efficiency as a purifier; then he (Mr. Livesey) must protest against its price. This was a very great element in the success of Weldon mud. There was a heavy royalty upon it—the charge being from £4 to £5 per ton—and it would have to do a great deal more than oxide before it was much used. They were greatly indebted to the author of the paper; for, although in the past they had been purifying somewhat successfully, they did not really thoroughly understand the matter, and, in his opinion, Mr. Carpenter was working in the right direction.

Mr. J. W. HELPS (Croydon) said that Mr. Livesey had remarked upon Mr. Watson's expression of opinion that the system carried on at Sydenham was something like that described by Mr. Carpenter; and he (Mr. Helps) would go so far as to say that the system on which they worked at Croydon was very much the same as that described by Mr. Watson. They purified practically by lime alone. Until the present season, they had only four boxes, giving an average of 250 superficial feet per million cubic feet of gas. They had now four boxes of lime, two of which were put in and allowed to foul and form sulphide, and finally two boxes of oxide. He would go so far as to say that during two years (using about 1½ per cent. of air), they had no difficulty whatever in keeping the sulphur compounds well below 15 grains. There was one thing

he ought perhaps to mention. They used at Croydon one kind of coal only; but during the recent Durham strike, they had to employ such material as they could obtain. They then experienced some difficulty, as they were not used to having such a large amount of sulphur to deal with as found its way into the purifiers. But, even then, he was pleased to say, they did not get more than 15 grains. In connection with the 1½ per cent. of air he had mentioned, there was one point that did not appear to have been alluded to in the course of the discussion on the question of the rise in temperature. In their case they found a considerable rise, even higher than the 15° referred to by Mr. May; it was sometimes quite 30°. When he first started the air process, they had a great increase in the amount of naphthalene deposit on the works. It seemed to him that this rise of temperature would keep a large amount of moisture in suspension in the gas; and did it not also deposit naphthalene? At Croydon, they put the air in the first box. They employed one of Cowan's air-meters; and passed the air in at the back of the exhauster. Speaking of the results the author had obtained, it appeared that he purified 30 tons of coal with a yard of lime; while, putting in the air as they did at Croydon, they did practically the same amount of work. This being so, though he was fain to acknowledge that Mr. Carpenter's system theoretically was the correct one, he did not quite see where the advantage came in. It seemed to him that the important secrets of purification were: First, to have plenty of area; secondly, to use a certain amount of air; and, thirdly, to use the lime in as heavy layers as possible, and properly slake it—that was, have plenty of water in it. He agreed with Mr. Livesey, and it might be seen from every-day experience, that the sulphuretted hydrogen should be in advance of the carbonic acid.

Mr. A. F. Browne (Rotherhithe) said that, since he had been in charge of the Rotherhithe station of the South Metropolitan Gas Company, they had worked by rotation four lime purifiers, followed by three oxide catch vessels. His experience had been precisely similar to Mr. Gandon's. During the past ten years, they had purified with lime only; the oxide purifiers having been scarcely in work, for the simple reason that no sulphuretted hydrogen had got past the last lime box into them. It had been only on comparatively rare occasions that this had been the case. During the past decade at Rotherhithe, they had gone on purifying the gas from the sulphur compounds without any difficulty whatever, with the exception of one or two instances. On one occasion there was a rise in the sulphur compounds, which was due to bringing into action some boxes of which the connections had been altered, and the set had been recharged with clean lime throughout. When these purifiers were put to work in conjunction with the other set, which were under normal conditions, the sulphur rose. They got over this in a few days; but in the past summer they had had a little further trouble. During this time he was at his wits' end to know how to get over the difficulty. Mr. Carpenter called at Rotherhithe; and, in the course of conversation on the subject, he said: "Your four boxes seem to do each of them a little; but not one of them appears to do too much." That was true with the rotation system, as worked at the Rotherhithe station. He noticed the great difference between Mr. Carpenter's plan and his own, that the bulk of the work was done in one of the boxes. In this way, it seemed to him (Mr. Browne) that Mr. Carpenter was able to get his first and his second box more thoroughly carbonated than if he worked as they did at Rotherhithe. He had not been in the habit of introducing air into the boxes at all; and their system of purification had been very expensive. As a rule, the quantity of coal purified by one yard of lime had not exceeded 24 tons; while Mr. Carpenter had purified 30 tons. He should like to point out, however, that this 30 tons was not an exceedingly favourable result. At the Old Kent Road works, he happened to know that the average was at least that, and sometimes more. He believed in some half years they had purified as much as 38 tons. At Mr. Braidwood's works at Greenwich, 34 tons of coal were purified by a yard of lime; but he knew that Mr. Braidwood used a certain measured quantity of air. Mr. Livesey informed him that, at the Old Kent Road works, they were in the habit of regularly passing in air. Therefore he did not quite see that the introduction of the air to the third and fourth boxes resulted in any great saving of lime, if these experiments were a fair criterion; but, on the other hand, Mr. Carpenter did appear to be able to master the sulphuretted hydrogen boxes with great certainty. There was another way in which it seemed to him a saving might be effected by employing the air as Mr. Carpenter did; and that was he appeared to pass over into his oxide boxes a certain amount of sulphuretted hydrogen which was ultimately recoverable. He should be glad if Mr. Carpenter would clearly explain his views as to the saving realized by this process. With regard to the sulphuretted hydrogen and carbonic acid being in rotation, he agreed that, in order to be safe, the sulphuretted hydrogen should be at least one box in advance of the carbonic acid. That was the trouble he had to contend with last summer. Somehow or other, the relative positions of these impurities became altered—the carbonic acid caught up to the sulphuretted hydrogen, and then they could not deal at all with the impurities.

Mr. S. W. Durkin (Southampton) said he did not know that he could throw any new light upon this subject of purification, but he should like to record his experience with regard to air purification. He had now had it under weigh for the past two years; and he had no desire at present to discard it, unless he could find something better to take its place. Mr. Carpenter's idea was rather a step in advance. At Southampton, they measured the air in on the inlet side of the exhauster—sometimes going as high as 3 per cent., and at other times rather less. As far as the quantity of air was concerned, it did not appear to have had any material effect on the illuminating power. He worked on the rotation system; and he had six lime boxes now in use, and three oxide. He found, by closely watching and testing every day, that they could run the first lime box until it was fairly well carbonated. The upper tier certainly did not come off quite so grey as the lower ones; but this arose, he thought, from the fact that it got more moist from the condensation that took place during the passage of the gas. The lower tiers came out perfectly dry; and the moisture appeared to be driven ahead by the stream of gas, and condensed into the bottoms of the oxide boxes. Although they were not working under the sulphur clauses, he thought it was best to take out the sulphur compounds as far as possible. On the whole, since the introduction of air commenced, the cost of purification had been very much less than it was previously. Many years ago, in the good old days, lime was used entirely for purifying purposes; then the day came when oxide of iron superseded it. He was very much surprised on one occasion by a gentleman asking him to look into his office, as he had something curious to show him. He went, and found that he had an ordinary gas-stove in use burning illuminating gas. It had an iron pipe leading away into the flue; and at the overlapping junctions of this pipe, there were streaks of a yellowish-looking salt down the outside. Of course, he professed ignorance as to the cause; but he suspected what it was, and afterwards found that this yellowish powder contained a large percentage of sulphur. Testing by Letheby's system, he discovered that the sulphur compounds in the gas then amounted to something like 40 to 55 grains per 100 cubic feet. A great deal had been said with regard to the expense of removing sulphur compounds; but he knew that, at the time he referred to, they gave off very unpleasant odours in rooms lighted by the gas. There was one other point—the effect of temperature. He had noticed that, when the temperature was falling, the lime boxes were not so effective as when at an average temperature. To overcome this in his own case, he slipped the gas by the condenser, and so kept up the temperature of the purifiers.

Mr. H. Smythe (Maidstone) remarked that about twelve years ago his Company came under the sulphur clauses; and during that time he had been working in different ways. Two years since he was working on the rotation system; and by this means he was able to keep the sulphur within the limits, as shown by the tests made practically every day by the County Analyst of Kent. The figure was from 10 to 15 grains per 100 cubic feet. Two years ago, his Directors thought they would like the sulphur kept under 10 grains. Of course, he did not like this; but he set to work, and was glad to say that he had been able to comply with their wishes. He simply effected the purification by four lime boxes—using the lime in layers of 9, 8, and 7 inches, and admitting about 1½ p. ct. of air. He believed in reducing the sulphur compounds to the lowest point.

Mr. J. Tysoe (East Greenwich) observed that the author of the paper had stated that what was wanted was as little sulphur as possible in the lime boxes, and that it should be passed forward into the oxide of iron. He (the speaker) found that they could not get the sulphuretted hydrogen sufficiently forward to go into the oxide boxes. He tried to thoroughly carbonate the first lime box; and when this was done, he found they were doing the best work with the lime. The only thing that would push forward the sulphuretted hydrogen was the carbonic acid; and he should like a little information as to how Mr. Carpenter could regulate this. If it was necessary to get it forward, how could it be managed?

The President remarked that, before calling upon the author to reply, he should like to state the method in use at his own works, which might also be called the rotation system. They had six purifiers, four of which were filled with lime, and worked in rotation, and then two filled with oxide to act as catch boxes. With crude gas, containing, at the inlet of the purifiers, something over 30 grains of sulphur compounds, they had no difficulty in reducing it to 10 grains; and it was scarcely ever above this figure. He thought this rotation system was more simple than any other arrangement in use; and, as far as he could see, it was quite as economical. Before leaving home that morning, he calculated the quantity of lime used per million cubic feet; and it worked out to about 2½ yards, which was equal to 37 tons of coal per yard of lime. Something had been said as to the desirability of removing the sulphur compounds, and of that he had no doubt whatever in his own mind. If the proper ventilation of rooms could be ensured, there would be no need to devote so much time to sulphur compounds, or to spend such a large amount of money in trying to remove them. They had little control over this question of ventilation; and they must make the best of things as they found them, and endeavour to send out the gas as pure as possible. He thought Mr. Carpenter had helped the members a good deal by showing them the proper way to use air.

Mr. CARPENTER, in replying to the discussion, said he was much obliged to the members for the care and very evident attention they had given to the paper. There was one point in reference to the amount of coal purified per yard of lime. At the Vauxhall Gas-Works, his station meters were rather more than half a mile from the works; and they were arranged in this way: He had two sets of lime purifiers, and there were mains which ran down to Kennington Lane where the meters were situated. While engaged on the experiments alluded to in the paper, he thought it highly desirable to work with one set of purifiers instead of two; so that, if the sulphur compounds went up, he would not open another stream, but would keep them down with one set only. Besides he had no means of measuring the amount of gas that passed through either stream. The two streams of gas were measured together; but the whole of the experiments had been made with one set of lime purifiers. As to "the superficial area of the purifiers per million cubic feet of gas produced," it would be seen from the table that the maximum area of the boxes throughout the experiments had been 324 superficial feet per million cubic feet of gas; the minimum, 243 feet; and the mean, 302 feet. He believed Mr. Newbigging had said that 600 feet were required; and Mr. Frank Livesey had placed the figure at 500 feet. Therefore, he had been working with a very limited purifying area. This was one reason why the amount of work done by the lime was not its maximum. At the beginning of the experiments, when they were working with the purifying area equal to 324 feet per million cubic feet of gas, they were using less lime than at the close of the experiment with 243 feet only. On two occasions during last summer, the maximum reached was 12·2 grains; so that when they looked at the question of the amount of lime used, they must bear in mind the lowness of the sulphur compounds and their regularity, and the small purifying area they had to work with. The President and most of the speakers had urged how important it was to have a large purifying area; and he felt pretty sure that some of the members had several times more than he had to deal with in the course of these experiments. He remembered one case in which the results of some experiments were given; and there they had no less than twenty times the area of purifier capacity he possessed at Vauxhall. Mr. Tysoe had spoken about the amount of sulphur precipitated in the vessels. They could get rid of the sulphuretted hydrogen in either of two ways—(1) by absorbing it in the lime vessels, or (2) it could be precipitated as free sulphur. But they did not want to precipitate it as free sulphur, because at present it was not recoverable in this form from spent lime; and they would be using up both their air and sulphuretted hydrogen in the wrong place. Mr. Durkin's experiences were very interesting to him—especially on the question of temperature. He believed he had delicately hinted in the paper that there were some reasons in favour of placing the purifiers in a purifying-house rather than have them situated in the open air. They could not expect this complex action to go on with a temperature varying from zero to above 100° in the summer time. They took a great deal of care to maintain the temperature of the vessels at Vauxhall. They did not "slip by" the condensers in the way referred to by Mr. Durkin; but, by means of steam, they kept the temperature of the gas leaving the washers at from 70° to 90° throughout the year. They never let the temperature go lower; and he thought further investigations would prove that more attention should be given to the effect of temperature. Mr. Durkin stated that he was able to use 3 per cent. of air without finding any ill effect as regarded the illuminating power. He (Mr. Carpenter) thought that, if they used air at all, and so had nitrogen in the gas, there must be some reduction of illuminating power. With regard to Weldon mud, as Mr. May had pointed out, when oxide of iron was used for a long time—that was, until it was saturated with sulphur—there was so much back pressure that the boxes had to be cleared. Now he (Mr. Carpenter) thought this was rather a good thing; and for this reason: One drawback (and he thought the only drawback) in the use of this mud was that, instead of the pressure increasing as the mud became saturated, it decreased. Consequently, great care was requisite in putting the material in the purifiers—in having it laid perfectly evenly over the whole area—as where the gas passed through and sulphided the material, the area of passage was increased; that was to say, as the material got foul, the gas would go through more easily. The pressure given by the Weldon mud was reduced very considerably as its saturation increased. Mr. Watson and one or two other gentlemen said that their purification was practically all done by lime. Well, that was, of course, a distinct point of difference between their working and what he (Mr. Carpenter) had been doing. If they put the air in at the right place, they would naturally see that the sulphuretted hydrogen was necessary in order to get rid of the sulphur compounds, and the other went forward into the catch vessel where it would be of use. He ought to have mentioned that Weldon mud in the condition in which it was first placed in the boxes gave much less pressure than oxide of iron. Oxide, so far as his experience went, in order to work it in boxes of small area, required to be wet, or put in in thin layers. They were able to pass 6 million cubic feet of gas through a box area of 1020 square feet, with a pressure of about 2½ or 3 inches, which was very low. With regard to the question of taking out the sulphur compounds, the fact that it was a difficult process was not in itself a reason why they should not be taken out. Mr. Gandon had had a long experience in the removal of sulphur compounds—in fact, the difficulties under which he laboured some years ago had the attention of skilled chemists. But for a long time little success followed their investigations; and therefore one could not wonder that gas managers looked upon it as a very troublesome matter to take the sulphur compounds out. However, the sulphur compounds were only a small percentage, compared with the carbon dioxide; and he thought it went without saying that, if they could run the sulphur purification parallel with the carbonic acid purification, they would find the cost was not so great as it appeared to be. It was not fair to attach the whole of the cost of the lime to sulphur purification; a large proportion of it being due to the extraction of carbon dioxide.

Mr. W. D. CHILD (Romford) moved a vote of thanks to Mr. Carpenter for his instructive paper. The subject he had dealt with was one of the greatest value to everyone connected with the management of gas-works, even if, like himself, they were not burdened with the necessity of removing the sulphur compounds. He thought that, whether or not it was a matter of necessity, they ought to remove them, in order to add to the comfort of the consumers. He ventured to hope that Mr. Carpenter's year of office would be as instructive to himself as it bid fair to be to the members.

Mr. R. M. COUPER (Newbury) seconded the motion, which was unanimously agreed to.

Mr. CARPENTER, in acknowledging the vote, remarked that he was extremely disappointed he had not been able to have the experiments further advanced than they were; but he hoped to be able to say something more about them, through the medium suggested by Mr. May, at the meeting in February.

This concluded the businsss proceedings; and the members then took tea together.

MR. WILLIAM YOUNG'S NEW OIL-GAS PLANT.

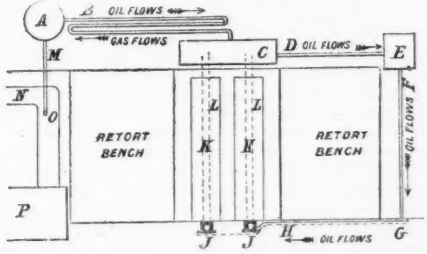
Description of the Invention.

It may be remembered that in the JOURNAL for Oct. 18 last our Edinburgh Correspondent announced in his "Notes" that Mr. W. Young, of Peebles, had invented a process for the enrichment of coal gas with oil gas, which was likely to lead to very important results. As the announcement has created a great deal of interest, we are glad to be able to lay before our readers a description of the invention. Our correspondent stated that Mr. Young undertook the task of investigating the subject more in the interest of the oil than of the gas industry. As a matter of fact, his instigator was Mr. John Fyfe, the Managing Director of Young's Paraffin Light and Mineral Oil Company; and the first step in the proceeding was taken some years ago. The idea was to discover some means whereby the oil trade of Scotland could be rescued from the eclipsed condition into which it had been thrown by the enormous importation of American and Russian oils. Mr. Young set to work with a will—his interest having been all along more in oil than in gas; and it is needless to say that he started on his experiments with a knowledge of the subject which was so far in advance of that possessed by many, that he was able, at the first, to discard every one of the accepted processes of oil carbonization. Hitherto the process universally followed has been to carbonize the coal and oil in the same retort, and to subject the gases to the same treatment after leaving it. This Mr. Young has entirely set aside. He has been for years familiar with the process followed in the manufacture of gasoline, where the gas that is generated is purposely kept in the liquid which is sent out to be gasified. Borrowing a hint from this process, he vaporizes the oil, and, instead of retaining the illuminating gas which is part of the product, he releases it, and sends it on to the purifier—keeping back merely the portion of the oil which has not been converted into illuminating gas. It is there that the first point of his invention comes in. When oil is introduced into a retort, it is very quickly converted into vapour, only a small proportion of which, however—about one-fifth or one-sixth—is illuminating gas. The rest consists simply of vapours, which, on the opportunity arising, will once again resolve themselves into oil. That which has been really gasified will remain so like any other gas; but then the question arises: What will resolve the ungasified vapours? Mr. Young has been able to supply the answer; and it is simply this: Oil itself. Working on these two radical priciples, he has succeeded, where all others have failed, in carbonizing the whole of the oil. Where others, working with a high heat, found that they had trouble with the inlet or the ascension-pipes choking, or, on the other hand, working with a low heat, that the gas was robbed, by condensation, of its illuminating properties and there was trouble from condensation, he has no difficulty whatever. In his hands, the whole of the gaseous products of the oil are extracted, but not at once; and those which, if passed on, would condense, are sent back to be again subjected to treatment in the retort. In Mr. Young's view, oil is a hydrocarbon, and contains nothing but gaseous products and carbon. There is practically no tar, nor any condensable or non-gasifying liquids, in it. The mistake hitherto

made has been in attempting to gasify oil at one operation. When a quantity is placed in a retort, it is found to vaporize very quickly and pass on; but time has not been given, and it cannot be taken, in the retort, for the complete gasification of the whole of it. Consequently, the portion which has been merely vaporized, but not gasified, will sooner or later return to a liquid state. By Mr. Young's process, the earliest opportunity is taken for converting these vapours again into oil, and sending it back to the retorts for further treatment. Working in this way, he obtains practically only two products—a permanent gas of nearly 100-candle power, and a very rich coke. The only other product is a very small percentage of sulphuretted hydrogen, which is eliminated by the purifiers.

In describing the process, it may be said that it is simplicity itself. No materials are required except the oil, with the addition of the heat of the oven; and no mechanical appliances are used, not even an exhauster. The starting-point of the process, for purposes of description, is the scrubber. This is an apparatus entirely similar to that which Mr. Young has introduced for the treatment of coal gas. It is of the familiar upright cylindrical shape, of cast iron, and is built in sections. Each section has a diaphragm, or shelf, in which are a number of papilliform openings, pointing upwards. Each opening is covered by a tin cap, from the centre of which a wire passes downwards to keep it in position. On each diaphragm there is, in the oil process, a supply of oil, regulated so that the tin caps dip into it to the extent of one-eighth of their depth. From the scrubber there proceeds, at considerable length, a condensing-pipe, in serpentine form, placed horizontally, but with a dip falling away from the scrubber. On the top of the scrubber is the oil-supply reservoir, with graduated scale and regulated outflow. By an ingenious arrangement, the outflow is so managed that, according to the prevailing temperature, it can be directed into either of the divisions of the scrubber. The scrubber in use at Peebles contains four diaphragms. In time of severe frost, the fresh supply of oil can be sent into the scrubber above the top diaphragm, and so be caused to pass down through the other three. In milder weather, the fresh oil can be introduced at will into the space above the third, the second, or the first diaphragm. Last week, when our representative had an opportunity of seeing the apparatus at work, the temperature was such that the oil was not passed into the scrubber at all, but was sent direct from the reservoir on the top into the end of the condenser next the scrubber; due provision being made for the renovation of the oil in the scrubber. As stated above, the condenser has a dip away from the scrubber; and when once the oil is in the condenser, it travels, against the flow of the gas, into the hydraulic main. From the latter (provision being made for sealing), the oil is carried forward to a reservoir where it is stored till it is required to be sent into the retorts. From this reservoir, again, a pipe leads into the retort-house, where there is placed a regulating apparatus, by which the man in charge is enabled to control the whole of the process. The retorts are used for oil only. With ordinary oil they run 24 hours without being opened; but should the oil deposit carbon in such quantities as to necessitate it, they would, of course, be opened more frequently. The oil is led from the regulating apparatus, through a properly sealed pipe, into the ascension-pipe, about half way up the face of the retort. Entering there, and flowing down the ascension-pipe, it helps to keep the passage open. In addition, the retorts are maintained at a low temperature—a dull red heat; and the two influences combined prevent any tendency to choke. As a matter of fact, when the retort-lid is taken off at the end of 24 hours, all that is found is a stalactite-like formation of carbon at the mouth of the ascension-pipe, with an opening, however, in the centre of it, which is sufficient for the entrance of the oil and the exit of the gases. Such a thing as a choked pipe has never been known with this process. The retorts dip to the back, for reasons which will be explained later on. The oil, having been introduced into them, is, as stated above, vaporized; and the whole of the vapours pass up the ascension-pipe and into the hydraulic main. This is sealed with oil, derived from the condensers; and the condensable vapours are there arrested to some extent. Passing onwards, the gases enter the condenser, down which, as already explained, the fresh oil flows; and there a further portion of the condensable vapours are resolved again into oil, and flow back into the hydraulic. Should the gases pass the condenser, they have still to encounter the scrubber, through the four diaphragms of which they have to bubble; and the result found in practice is that, by the time the uppermost diaphragm is passed, all that remains of the vapours which left the retort is a permanent gas, possessing exactly the same properties, except as regards its specific gravity, as that derived from coal. Having passed through the scrubber, this gas is led into the main which comes from the coal-gas condensers, and, mingling with it, flows into the purifiers. So far as the oil-gas process is concerned, the operation there comes to an end. The difference in the specific gravities of the two gases is found to be no bar to their combination. For all practical purposes, when the two gases enter the purifiers, they are one; and after they leave the purifiers, no difficulty is experienced with respect to their intermingling. Neither is there any deposit in the pipes—that being out of the question, seeing that all that leaves the scrubber is simply illuminating gas and a little sulphuretted hydrogen. To return, however, to the process. It has to be noted that the vapours, on leaving the retorts, consist of only from one-fifth to one-sixth of permanent gas, and that the remainder are again converted into oil, and sent back to the retorts. Consequently, the latter, dealing with this five-sixths, or thereabouts, of "old oil," cannot take a full quantity of fresh oil; and the supply of fresh oil from the reservoir on the top of the scrubber must be only one-fifth or one-sixth that which is passing through the retorts. This is one of the most ingenious parts of the process—the maintenance of two different degrees of flow; but the apparatus is so arranged that, in practice, there is no clashing of the two "interests." If the inflow of fresh oil is too slow, all that happens is that the store in the reservoir serving the retorts falls; and an indicator gives warning in time to enable the supply to be augmented. In the same way, if the quantity is more than the apparatus can deal with, the only result is that the oil in the retort-supplying reservoir rises, and the attendant has simply to restrict the supply of fresh oil. The process is so flexible that, if it is required to produce more oil gas, the attendant has simply to fire up, and augment the supply of fresh oil; or if less should be needed, he merely has either to cool down, or throw the retorts out of use for an hour or two.

In making the oil gas, the process is continuous, and does not require any attention, except in regard to the heat and the inflow of oil; and the latter only requires looking after once in every two or three hours. The retorts at Peebles—both those employed in the manufacture of coal gas, and those which have been adapted to oil-gas making—are fired on a semi-regenerative system, which Mr. Young has devised. The method of firing has, however, nothing to do with the efficiency of the oil process. For the working of this, a setting of three retorts has been withdrawn from the work of producing coal gas, and the oven has been fitted up with two retorts suitable for carbonizing oil. The method of working consists in simply closing the retorts and turning on the oil; then, at the end of (say) 23 hours, the oil supply is cut off, and the retorts are allowed to stand for an hour, in order that the last-run oil may have time to vaporize, and the coke to solidify. When a retort is opened, all that is found is a few carbon stalactites at the mouth of the ascension-pipe, and a thin layer of coke in the bottom of the retort. This is easily raked out; and the bottom is then scurfed—an operation which is easily performed. The retort is now ready for another turn. While Mr. Young is superintending the process, it should be stated that Mr. A. Bell, jun., the Manager of the works, has charge of the whole of the operations, and that he is keeping a record of the quantity of oil consumed in every charge, and of the resultant gas and coke.



A Scrubber, with oil reservoir on top (regulating apparatus not shown). B Condensers, with dip towards C. C Hydraulic main. D Outflow oil-pipe from hydraulic main, carrying five or six times the quantity of oil drawn from the reservoir at A. E Oil reservoir from which the retorts are supplied. F and H Supply-pipe to retorts, doubled after passing G. G Regulating apparatus for flow of oil into the retorts. J Mouthpieces and ascension-pipes. K Ascension-pipes running along the top of retort-bench to hydraulic main. L Retorts, with dip to back. M Pipe conveying oil gas from scrubbers to purifiers. N Pipe conveying coal gas from condenser. O Point where oil and coal gas intermingle. P Purifiers.

We will now give a more technical description of the process; the plant for carrying it out being shown in the above diagram, which is drawn from recollection, and is not according to scale. It is simply intended to give a better idea of the working of the process than the letterpress probably conveys. If it had been intended to furnish a correct representation of the plant, the purifier would have been shown as far away from the retort-bench as nearly half the width of a column of the JOURNAL. The consideration of space is the only reason for N, O, and P being brought so close to the retort-bench as represented. The plant may be said to consist in decomposing the oil by repeated alternate exposures to a dull red heat in the cast-iron retorts, and condensing and washing with oil; the result being the entire splitting up of the oil into gaseous products and solid carbon. The plant employed is very similar to that used to carbonize coal for the production of gas—consisting of retorts, hydraulic mains, condensers, and scrubber-washer. The retorts are of cast iron, 2 feet in diameter, and 9 feet long, and circular in form. Two are placed in a setting, with a considerable fall to the back. Each retort is provided with a stand-pipe 5 inches in diameter. The condensers and scrubber-washer are arranged to allow of the liquid products falling back into the hydraulic main, from which they are drawn off into a covered cistern provided with a float and indicator. From this cistern they are allowed to flow in regulated streams into the stand-pipes of the

retorts. The supply of oil to be decomposed is obtained from a cistern placed on the top of the scrubber-washer. By suitable arrangement of pipes and valves, the oil can be admitted to flow down through the whole or any number of the compartments of the scrubber-washer, or it may pass direct to the hydraulic main, according to the amount of washing and decomposing to which it is desired to subject the gaseous products. The oil is admitted to the plant by a graduated valve, flows backwards through the apparatus, and collects in the covered cistern at the end of the hydraulic main. When there is a sufficient supply of oil in the cistern, it is admitted, by means of suitable valves and syphon pipes, into the retorts, as already stated, through the stand-pipes. When passed into the retorts, which are heated to a dull red heat, the oil, flowing down the inclined plane on which they are set, is volatilized—the more volatile constituents first, and the less volatile only after they have travelled well down to the far end of the retort. The different oils are thus subjected to varying amounts and periods of heat, which leads to their partial decomposition in a gradual manner according to their volatility. The partially decomposed oil vapours pass away up the stand-pipes, where they are to a certain degree washed and condensed by the inflowing oil. The washing of the decomposed products is continued in the hydraulic main, condensers, and washer, by the oil flowing back to again undergo decomposition. The gaseous products of decomposition are thus rendered free from vapours which might be condensed; and they are thereafter passed through a meter, and commingle with the coal gas at the inlet to the purifiers. The quantity of oil fed from the supply-cistern into the arrangement is regulated so as to be equivalent to that portion which undergoes decomposition in the retorts; and the exact quantity is indicated by the float in the cistern which receives the oil and condensed products from the hydraulic main—the float rising when the amount of oil supplied is in excess of that which is decomposed, and falling when it is less. The oil and the condensed partially decomposed products washed back with the oil through the hydraulic main to the feed-cistern are regulated so as to flow into the stand-pipes of the retorts in quantity a considerable number of times greater than that of those decomposed. The higher the external temperature of the retort, the more rapidly are the oils and condensed products circulated through them, in order to keep the internal temperature within the range suitable to crack up the oil, and so avoid producing an excessive deposit of solid carbon. The result of thus decomposing the oil is that it is completely cracked up into gaseous compounds and solid carbon; the latter being all washed back into the retort, where it forms a very pure, hard coke of great value. The coke does not at all adhere to the retort, but is easily raked out. There is no deposit whatever of carbonaceous matter on the top of the retort; and the stand-pipes are left absolutely clean. The relative proportions of the coke and gas are dependent upon the character of the oil employed, and the temperature and rate at which it is circulated through the retorts in the process of decomposition. Any description of paraffin or petroleum oil, however crude, can be worked by this process; but what has been principally used at Peebles, and now wholly employed, is what is known as "blue oil," which is the portion of crude oil containing paraffin scale in solution, but which has been partially refined, and had its valuable scale removed. The oil is of a dark blue opalescence, and of specific gravity ranging from ·880 to ·890. It can be very cheaply supplied in large quantities by the Scotch oil companies. From this class of oil, 21,000 or 22,000 cubic feet of gaseous products, and between 5 and 6 cwt. of pure coke, are obtained per ton. By decomposing the oil at higher temperatures, a much larger volume of gas is produced; but the quantity of solid coke left in the retort is increased very considerably, and the gross sperm value of the gaseous products is much reduced. Indeed, the object of the process, as worked at Peebles, is to produce an enriching agent as permanent as possible in character, irrespective of volume. The specific gravity of the gaseous products is very high—nearly that of air. A gallon of oil yields from 6¼ lbs. to 6½ lbs. of gaseous matter, which has a greater enriching value than a gallon of gasoline, and yields more light, when diffused through coal gas, than a gallon of paraffin or petroleum oil burned in the best form of lamp. Since the process of enriching coal gas with oil gas was commenced at Peebles, the coal used has cost 11s. 4d. per ton, delivered at the works; and it yields 9500 cubic feet of 18-candle gas per ton. It requires 1900 cubic feet of oil gas added to the 9500 cubic feet of coal gas to bring up the illuminating power of the mixture to 30 candles. The present cost of the oil, delivered into the works, is 40s. per ton; and, as already stated, it produces from 21,000 to 22,000 cubic feet of gas of an enriching value equivalent to the product of at least 4 tons of first-class cannel. The present cost for materials to produce 30-candle gas, calculated from the above data, is 15·66d. per 1000 cubic feet. It is probable that, if the process should be generally adopted, as is likely, the price of oil will rise, with the increased demand, to perhaps 60s. or 65s. per ton. At that figure new life would be infused into the Scotch oil industry. American and Russian oils might prevent the price from going up any farther; but, taking oil at 65s. per ton, the cost of producing, by this process, gas of 30-candle power would only be 18·01d. per 1000 cubic feet. The gas and oil industries would thus both be benefited.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Anthracene.

Sir,—I regret that, in my former letter to you, I fell into an error in saying the South Metropolitan Gas Company sold their tar on a sliding scale. My informant was one of the largest London tar distillers, who told me the South Metropolitan Company sold their tar to only one firm, and on a sliding scale; and, never having heard of their tar contract being in the market, I assumed it was correct. I must sincerely apologize for my error.

Mr. Livesey says "even if it were true, it would not make them tar distillers." Surely, if a firm sell their goods to another to work up, they sharing, by a sliding scale, the profit or loss, they must be partners. Being partners, they are a part of the firm; and if that firm are tar distillers, then they must be tar distillers. Mr. Livesey also says that, if anthracene were higher, tar distillers would give more for tar; therefore, in this case, and to this extent, their and the other gas companies' interests are the same. But is it so? Give up the profit at once on the speculation that the rise will remain firm, and madly rush to give the gas companies the increase, and where is the mutual interest? It never can be; and no gas company believes it ever will. Neither does Mr. Livesey. A buyer wants his purchases as cheap as he can get them; and a seller wants as much as he possibly can obtain. The only point upon which they can agree is that they shall not "Jew" each other for the sake of future business.

But let this go. Now to the point: How can we improve our position? Mr. Livesey lays the blame of our present state on The Gaslight and Coke Company. But how, and why? They do not conduct their trade on business lines; and they decline to burn their tar. In what way have they not acted as any ordinary tar distiller would? Are they to hold stock? If so, I think they know better; for others would sell, and they would be "in the cold." Are they to join a syndicate? If so, of whom? Tar distillers? If so, is B anthracene to be on the same footing as A anthracene? If not, who are to form the syndicate? But, if this is to be so, then the Beckton people are to "make the running" for a second-class article. If this neither is to be done, are they to sell to a buying syndicate? If my memory serves me rightly, this has been tried and has failed. The fact is, the struggle for existence is so keen, that the Beckton people act as I would do in their place—trust no one; for if they did, they would be "sold." *Experientia docet.* Mr. Livesey says that the Beckton people would not burn their tar when others did. Well, I say it shows their sense. Burn your tar to get a better price for what is left? I cannot understand this method. It might work well in Ireland, but not among thinking men. And why? Because there is a sale for all the tar products that are made, and more. In proof of this, the stocks are no larger than usual. All can be *sold at a price.*

It is only a question, then, not of burning, nor of the wicked Gaslight and Coke Company, but simply how can the price of products be raised to bless the gas companies and augment their dividends by the increased value of tar. A perfectly just and proper way for all gas people to look at the question. But Mr. Livesey does not say how. I did, but he took no notice of it; and yet this is the main point. If The Gaslight and Coke Company, and some of the other large makers, converted their products to their ultimate point—colour—they would not only take their benzol, toluol, anthracene, &c., out of the market, but they would have the world for their customers, in the place of a perfect shoal of German parasites buying their half-manufactured goods. This would increase the value of the anthracene, &c., then in the market; for foreign buyers would not do as they do now—wait till the plum is ripe to drop into their mouths—but would have to buy from those who could speculate. This would raise the price of all colours—*i.e.*, dyes—and render the markets firm. I know the Indian and Colonial buyers, as well as those in America, purchase from abroad the bulk of the dyes which we could, and should, make. It only wants energy and capital. Why we remain the cat to pull the chestnuts out of the fire for the foreign monkey, passes the comprehension of

Nov. 10, 1892. A Silly Tar Distiller.

Regenerative v. Ordinary Settings.

Sir,—I have been very much interested in the discussion which has been going on in the Journal in reference to the above subject; and I had hoped that Mr. Latchford would have detailed at length, for the benefit of his *confrères*, his working of ordinary furnaces, so that they might see how it is he can do so much better than anybody else. I have been looking up past papers in The Gas Institute's proceedings, and find that, in 1882, a discussion took place on Mr. Valon's paper on "Generator Furnaces," when Mr. G. E. Stevenson took up the question of selling coke by measure, and instanced a place near London where, with ordinary furnaces, the consumption of coke was 9 per cent. of that produced. Are Broadstairs and the "place near London" identical? I considered, at the time the paper was read, taking Mr. Stevenson's statement as correct, that truth was certainly "stranger than fiction." And I am now more than ever convinced of it.

I have worked both ordinary settings and generators, and find that, though it is possible to get the same results, in point of production per mouthpiece, from an ordinary setting as in the case of a generator, yet the former soon breaks down under the strain, whereas the generator does its work month after month, and year after year, without difficulty and excessive wear and tear. In a neighbouring works to mine, a number of beds of sevens have worked more than three years; and, on being renewed, the furnace arch, which is usually the weakest place in the setting, was found to be in such good condition that the material was all used again in the re-setting. I consider this speaks well for gaseous firing, and in a direction which has not been touched upon by Mr. Latchford.

Again reverting to my own working, I may give you from my books a few figures which will show what I am doing with the generator system. My retorts are 20 in. by 14 in. by 8 ft., ⏢ shape, are set in sixes and threes, and are heated by Drake and Son's form of furnace.

In a five days' observation of a bed of three retorts, we made 106,500 cubic feet of gas. The coal used was 10 tons 8 cwt.; coke produced, 7 tons 2 cwt. 8 lbs.; coke used in furnace, 1 ton 3 cwt. 1 qr. 17 lbs., or, as I make it, 11·25 lbs. for every 100 lbs. of coal carbonized. I produce 10,240 cubic feet of gas per ton of coal, and 7100 cubic feet per mouthpiece. I have no exhauster; and the back pressure on the retorts is 4½ inches. I have worked four-hour charges four times, and an eight-hour charge once in 24 hours, and have locked up the retort-house at 11 p.m., and opened it at 7 a.m.—finding the retorts in splendid condition. I am working a bed of three retorts where one of six on the ordinary setting barely sufficed. Taking all into consideration, I do not see that Mr. Latchford is doing anything extraordinary, except in his fuel account, which, by his own showing, is only based on supposition. In my working, I save a night man at the expense of one charge only. Having given a brief outline of my working, I will only say that the cost of the generator furnace and appliances was about £40 in addition to the setting of the retorts, which, taken at 5 per cent., means that I have only to earn £2 more per annum to balance the interest on capital; and I am saving ten times this amount.

I hope these few figures may prove useful at all events to managers in small works, like myself, and at the same time combat Mr. Latchford's statement that there is nothing to be gained by generator or regenerator firing.

T. SETTLE.

New Mills, near Huddersfield, Nov. 11, 1892.

Guiding Gasholders without External Framing.

SIR,—I have noticed for some years patents being taken out for guiding gasholders without the usual external supports; and I have seen illustrations thereof in the JOURNAL. A cursory glance at them having satisfied me that I should prefer the old mode of guiding, I have paid but little attention to the learned discussions that have taken place between your correspondents, until I saw in your last issue that an action for infringement had been decided in the Courts on this subject. From this I gather that there is considerable similarity between the patent and what I did in the year 1852 to a gasholder at the Rotherhithe Gas-Works.

The case was thus: I took the management on Christmas Day, 1851. The works had only been in operation a few months, and the outer lift of the telescopic holder had never been raised. In a few days I began to raise the outer lift, when I found it difficult to keep it level. After trying for several days, when it was some two-thirds up it uncupped, and landed in about a minute—reducing my stock of gas to what was contained in the inner lift. This was so serious that, unless I could do something with it, I could not supply our customers. I consequently decided on the following plan: I knew that a man with the point of a lever under the edge of a side sheet, or under a rivet-head, could, by a few pounds' pressure, level the holder. It was therefore only some equalizing power that was wanted, by which one part would pull upon another, and thus maintain a level. Acting on this principle, I surrounded the holder by a chain and pulleys, and took a firm hold of the chain, at eight equidistant points in the circumference, by arms attached to the outer lift. As the holder rose, each of these arms had to rise at the same rate; and thus it kept level. In descending, the arms returned to their original positions. We had no further trouble with the holder, except having to unship the chain once or twice, because of its lengthening, as the links became worn into each other, beyond the length that some right and left hand screws enabled us to tighten it up.

I do not recommend the system, unless as applied in the peculiar circumstances which I had to deal with; and had I a similar case, I would do it again, and I hope without infringing any subsequent patent. The cause of all the trouble was that the cast-iron tank had sunk 6 inches on one side, owing to bad foundations.

GEORGE ANDERSON.

Nov. 10, 1892.

Gadd and Mason v. Manchester Corporation.

SIR,—In matters of mere opinion, however questionable I might think them from an ethical point of view, I should not ask to object to editorial remarks; but in detailing facts of recent history, I feel sure you will desire to be exact. I therefore request you to kindly correct the statement in the article appearing in your last issue, on the above subject, which describes Mr. Justice Kekewich's judgment as given against us on "several" points, and that you have set forth those points in your columns. This is an error, no doubt without intention, as Mr. Justice Kekewich gave against us on *one* point only; a second he gave in our favour; and the third he did not decide upon.

W. GADD.

Manchester, Nov. 11, 1892.

Stopped Ascension-Pipes.

SIR,—In the JOURNAL for the 1st inst. (p. 771), there is a paper read by Mr. T. B. Jones, of Willenhall, before the Midland Association of Gas Managers, on the subject of "Stopped Ascension-Pipes: Their Cause and Cure." Mr. Jones enumerates many supposed cures for this trouble in the retort-house; and I will give a few more, as follows: Mr. Burch's patent of an inner door-plate, placed within the retort, just before the iron mouthpiece; Mr. Green's shields, used by him at Dartford (shields with bored holes); Vincent's patent gratings, used at Hastings, Montargis, and Messina. The late Mr. G. Lowe and the late Mr. A. Wright employed wrought-iron turnings, formed in the *shape of a drum*. These two gentlemen found the results excellent as an experiment, but the plan was impossible in a retort-house in full work. This took place upwards of 40 years ago. I worked Vincent's patent gratings at Hastings many years since, and found that putting them in the retorts, taking them out, and cleaning them afterwards caused a great deal of trouble; besides, they occupied space in the retort-house. I have used for the last 17 years Mr. George Livesey's remedy, mentioned by him at the meeting of the British Association of Gas Managers in 1874, when he was President—viz., two men and an iron rod. I may add that, if there are many stopped pipes in a retort-house, it is on account of faulty construction.

In conclusion, I may say I am afraid that gas companies will act as Mr. T. B. Jones's respected father did—have none of those drums on their works.

LAYARD JONES.

Rome, Nov. 9, 1892.

Carrying Gas-Mains Through Water.

SIR,—I shall be glad if any of the readers of the JOURNAL who have had experience of carrying gas-mains through water will oblige by giving me a few particulars in regard thereto. I propose to carry a 7-inch main through the bed of a rather fast-flowing and also tidal river—the Ness; and, besides strengthening it with spikes driven well in, I would give it (say) 15 inches of covering. I think coffer damming would be the best method of accomplishing this; but I should be glad to have the experience of others in the same work.

J. THOMSON.

Gas-Works, Inverness, Nov. 11, 1892.

[Our correspondent may be reminded that paragraphs on the subject of his letter have appeared at various times recently in our columns.—ED. J.G.L.]

The Electric Lighting of the Safe Deposit Company's Premises

SIR,—I notice, in your last issue, under the heading "Electric Lighting Memoranda," a paragraph in which you refer to the Marquis of Tweeddale's speech at the meeting of the National Safe Deposit Company. As I was the contractor for the lighting, I hope you will allow me to make the following remarks, which may be of interest to your readers.

The current is not generated by a gas-engine, as you say. The dynamo is driven off a countershaft from the main engine, which drives the fans, hydraulic pumps, &c. There are about 120 lights of 16-candle power; but there are seldom more than 30 in summer and 45 in winter alight continuously, or practically an average consumption of 2 units per hour. There is no doubt that the electric light has cost less than gas for the year 1892, as compared with 1891, in which year the Company adopted the Welsbach burners, which effected a saving of 45 per cent. over previous years. An interesting point is that, whereas the fans were driven to ventilate and drive out the products of combustion from the burnt gas (the premises being all underground), they have been almost dispensed with. The power they used to absorb is now given to the dynamo; therefore the light is produced by the power that was formerly practically wasted in ventilating—the net result being that the consumption of coke, which in 1891 came to £76, was reduced in 1892 to £74. (I admit that coke was cheaper in 1892.) The actual quantity used for producing the light amounted to less than £20. Of course, interest and depreciation have to be added to this, as also a slight increase in wages, which was given to the men to get them to take an interest in the plant. I may say that the wear and tear was inappreciable, and the repairs were *nil*, as they should be in an installation which is erected in a proper manner, and when the price is not cut down, as is unfortunately the case in most installations.

I notice that you are rather severe on accumulators. It would have been impossible to run the above installation without them, as the speed of the main engine varies considerably during the day. Notwithstanding this, the light is absolutely steady. I may mention that the loss occurs in charging the accumulators with their full charging current; but, as the strength of this is reduced, the loss is similarly reduced. When you use the cells more for regulating, and only for running a few lights when the engine is shut down, the loss is extremely small.

I might add that I produce the electric light at my house with a gas-engine for 1·5d. per unit=16 lamps of 16-candle power per hour, which means a consumption of 50 cubic feet per hour, or less than 2d., including oil (gas being 2s. 6d. per 1000 cubic feet). This speaks for itself as to whether or not large consumers should produce their own current.

ARTHUR B. GILL.

Nov. 11, 1892.

A New Aqueduct for Dublin.—The Dublin Corporation, at their meeting yesterday week, adopted a report which recommended that a second aqueduct be constructed in connection with the water-works from Callow Hill to Stillorgan, at a cost of £119,000.

Singular Gas Explosion at Bolton.—Considerable consternation was caused in one of the principal streets of Bolton last Thursday night by an explosion of gas at one of the large lamps. The lamp is fitted with Bray's burners and the illuminating power equal to 150 candles. About nine o'clock, whilst three youths were sitting on the base of the lamp amusing themselves with small lanterns, there was a loud explosion, which threw them all heavily to the ground. When picked up, it was found that they were more frightened than hurt; but the lamp was partially wrecked. The supposition was that there had been an escape of gas which was fired by the light of one of the lads' lanterns. On the other hand, the Corporation officials say they can find no trace of an escape of gas; and this renders the explosion all the more unaccountable.

Hexham Gas Company.—The annual meeting of this Company was held on the 2nd inst. The report submitted was of a very satisfactory character; the profits for the year being £1338, as against £814 for the previous year. The circumstances which had contributed to this were an increased yield of gas per ton from a cheaper quality of coal, the adoption of the manufacture of sulphate of ammonia, reduced unaccounted-for gas, and general economies in the working expenses, combined with an increased consumption of gas amounting to nearly 15 per cent. The Directors stated that it was very gratifying to them to be able to place such a satisfactory report before the shareholders, especially as these were the results of the first complete year under the present Manager (Mr. Herbert Lees). The report and accounts were adopted; and the maximum dividends declared.

LEGAL INTELLIGENCE.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Tuesday, Nov. 8.

(*Before the* MASTER OF THE ROLLS *and Lords Justices* LOPES *and* KAY.)

Paterson v. Mayor and Corporation of Blackburn—The Blackburn Explosion.

This was an application by the Corporation of Blackburn, as owners of the gas undertaking in that borough, for a new trial on appeal from a verdict and judgment for £600 given by Mr. Justice Denman and a Special Jury at the Manchester Assizes last July, in an action brought by the widow of James Paterson, who was killed in November, 1891, by a gas explosion, which occurred at the Crown Hotel, Blackburn, under circumstances which have already been fully reported.*

Mr. BIGHAM, Q.C., Mr. A. T. LAWRENCE, and Mr. MATTINSON appeared for the appellants; Mr. GULLY, Q.C., and Mr. V. FITZGERALD represented the respondent (the plaintiff in the original action).

Mr. BIGHAM, in stating the case, said the amount in question was only £600—this being the sum for which judgment was given for plaintiff—but the decision involved larger issues, as there were claims for about £20,000 or £30,000 in respect of the seven people who were killed and others who were injured by the explosion. The facts were in a small compass. For some 20 or 30 years, the stallholders in the open market-place at Blackburn had been supplied with their gas through a meter fixed in the cellar of the Crown Hotel; a Committee, of whom a Mr. Ormerod was Chairman, being appointed to attend to the matter. Difficulties having arisen, the Corporation decided that each stallholder should have his own meter; and accordingly Mr. Ormerod had an interview with one of the collectors—Mr. M'Minn—on the subject, and told him to cut off the gas. This, it was urged on the part of the plaintiff, the Corporation ought to have regarded as notice to them that the meter would be no longer used, and they should thereupon have taken care to see the gas was properly cut off. But the learned Counsel submitted that what actually occurred was that Ormerod's idea was not that the gas should be cut off permanently, but only temporarily, in order to compel the stallholders to pay up their contributions in arrear. The supply-pipe from the main to the meter was plugged by the Corporation's workmen; and several weeks afterwards, the meter was sold by Ormerod to a man named Robinson. Robinson and his brother—both unskilled men—were in the act of removing the meter, when the plugging came out; and the gas escaped in large quantities into the cellar. The men blew out the candles they were carrying, and, raising an alarm, sent to the gas office for assistance. Before this could be rendered, there was an explosion, by which the plaintiff's husband, who at the time was passing in the street, received mortal injuries. It was proved at the trial that, had the removal of the meter been made by the Corporation, as was the general custom, or even by skilled men, the accident could scarcely have occurred; or if it had, competent workmen would have taken care to stop the escape until help came to hand.

Lord Justice LOPES: You knew the meter did not belong to you, and might be removed at any moment.

Mr. BIGHAM said no, not at any moment; and, even if its removal were contemplated, it was not reasonable to put upon the Corporation the obligation of having in view and providing against such a removal as the one in this case. He submitted that the Corporation could not reasonably have anticipated that unskilled men would be employed to take down the meter.

The MASTER of the ROLLS: The question may be whether it was not negligent of you not to expect them to send an unskilled man; the supply-pipe between the wall entrance and the tap of the meter being, of course, always full of gas, with only the plugging to prevent its escape.

Lord Justice LOPES: And had the gas been properly cut off, no skilled person need, on your own showing, have been looked for to remove the meter.

The MASTER of the ROLLS: The matter seems to have been left to the jury.

Mr. BIGHAM submitted the following points: That the measure of the Corporation's liability was whether the explosion was what a reasonably careful man might be expected to foresee; that the notice given to M'Minn was no notice at all that the meter was going to be removed; that the conversation with M'Minn ought never to have been admitted as evidence; that there was no evidence to fix the Corporation with the knowledge that it was to be a permanent cutting off of the gas; and that, assuming they knew, or ought to have known, what was to take place, their neglect to make an accident next to impossible could not be called the effective cause of the accident.

Lord Justice LOPES: Had you done what you ought, it would have mattered nothing whether unskilled or skilled men removed the meter. I cannot at all see how the question can be said not to have been one for the jury.

Mr. BIGHAM having enlarged on his contention that there was no evidence to go to the jury, and that, in a way, there was misdirection by the Judge,

Mr. LAWRENCE followed on the same side.

At the close of the arguments, which extended to great length, the Court dismissed the appeal without calling upon Counsel for the respondent.

The MASTER of the ROLLS, in delivering judgment, said the husband of the plaintiff was killed when using, and rightly using, the public thoroughfare in which stood the premises where the explosion in question took place. Two main points had been raised in respect to the trial. First, it was said there was no evidence to go to the jury of negligence by the Corporation which conduced materially to the injury and ultimate death of this man; and, next, it was argued that, if there was some evidence, there was misdirection by the Judge. To deal with the second point first, it seemed to him that there was evidence of negligence to go to the jury, and that the mode in which it was left to them by the Judge was unimpeachable. As to the Judge withdrawing the case from the jury for want of evidence, it was objected that the meter was taken away by unskilled men by the authority of Ormerod, whose property it was, without first giving notice to the gas officials; and section 15 of the Gas-Works Clauses Act, 1871, was quoted. But, according to his view, this section was inserted for the protection of suppliers of gas, in order that the meter should not be tampered with by the consumer without the owner's knowledge, so that the register of the consumption of gas should not be destroyed. He came to the conclusion therefore, that the section did not apply in any way to the present case. The Corporation, as the owners of the gas-works, having entire control of the supply, were bound, having such an explosive compound as gas to deal with, to anticipate that, if it were allowed to escape in large quantities into a house or a cellar, the probability would be that it would explode, and injure people. Were they, then, in this case guilty of mismanaging the gas? There was evidence before the jury which, to his mind, was clear—that, by arrangement with Ormerod, they or their authorized servants knew that the meter was for sale (it was, in fact, offered to them); and it was equally clear that there was evidence upon which the jury might properly find that the servants of the Corporation agreed that, under the circumstances, the gas should be permanently cut off, or, in any case, they were to cut it off until an arrangement could be made to do so permanently. They did cut it off, by stopping the gas from entering the meter; and they did it effectively, supposing nobody had interfered with the meter. The question, then, was: Was there a want of reasonable precaution in the circumstances? The gas was in the main under the street, and going thence into the service-pipe; and the Corporation's servants came to the conclusion to cut it off at the end of that pipe. They knew that the meter was the property of Ormerod, and that, from the moment the gas was cut off, they would have no right to go into the cellar at all. Ought they not to have anticipated that the man having the right to remove the meter would do so as he chose? This was the point for the jury to consider; and he could not help thinking they were right in the conclusion to which they came. Gas was so dangerous a thing, that it required the greatest precaution, whether the supply was intended to be cut off permanently or even only temporarily. The jury had properly looked upon the fact of the defendants not having cut off the supply of gas to Ormerod's meter either at the main or at the place where it entered the cellar of the inn as showing negligence. Such being the case, he thought that the verdict and the Judge's directions were right, and that the verdict could not be disturbed.

Lord Justice LOPES, in expressing his agreement with the Master of the Rolls, said the gas-supplying authority were bound to provide against circumstances which a reasonably careful person ought to foresee and anticipate. The Corporation knew that the meter in question was not going to be used again; and, in order to ensure safety, the gas should have been permanently cut off. It seemed to him absolutely clear that there was evidence justifying the finding of the jury. If he had been trying the case without a jury, he should have arrived at the same conclusion as the jury did. As to the allegation of misdirection by the learned Judge, he thought he put the case before the jury even more favourably to the Corporation than he was bound to do. With regard to the section of the Act of 1871 which had been quoted, he agreed with the Master of the Rolls that it had no bearing on the case.

Lord Justice KAY, in adding his assent, said it was clear that, to have properly cut off the supply of gas, a suitable iron cap should have been placed on the end of the supply-pipe.

The appeal was consequently dismissed, with costs.

* See JOURNAL, Vol. LVIII., pp. 1052, 1091; Vol. LIX., p. 536; and *ante*, p. 121.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Nov. 9.

(*Before Mr. Justice* STIRLING.)

Davis v. Matlock Water-Works Company, Limited.

This action arose out of a dispute between the plaintiff, Mr. Davis, and the Matlock Water Company, in regard to the water supply for trade and domestic purposes to the plaintiff's hydropathic establishment known as Poplar Cottage, and situate in the Chesterfield Road, Matlock. In the year 1857, Mr. Ralph Davis, brother of Mr. Thomas Davis, the original plaintiff in the action, who has died since the proceedings were commenced (the action and the practice being continued by his son and successor), carried on business at Poplar Cottage as a hydropathist, and had three classes of patients—first, those who lodged at the cottage; secondly, out-patients resident at Matlock; and, thirdly, strangers who came to Matlock to be treated hydropathically, but did not take up their quarters at the cottage. The business was very successful; there being at that particular spot an abundant supply of water, in consequence of the physical features of the land. The water supply rose from a spring, called the Wold Spring, in a field to the northward, known as the Non. The stream divided into two arms, one of which flowed down a sharp incline to the Chesterfield Road, where it was collected in troughs, from which Poplar Cottage was supplied by two separate pipes—one for domestic, and the other for trade purposes. In this way the cottage enjoyed a free supply of water—that for domestic purposes having existed since the year 1790. The Matlock Water Company was established in 1860; and, under their parliamentary powers, they diverted this water supply into their reservoir, from which they supplied their customers. In 1867, Ralph Davis retired, and sold Poplar Cottage to a Mr. Knowles, who went into residence in 1868. By that time the Company had completed their works, and had carried along the Chesterfield Road a main, from which they, of their own free will, laid a ¾-inch pipe into the cottage, to which they supplied water free of charge until the month of November, 1889. In the year 1874, Mr. Thomas Davis purchased the cottage from Mr. Knowles for a sum of £900, which was £400 more than the latter had paid for it, on account of the free water supply which the property enjoyed. Mr. T. Davis carried on business there until he died. In 1876 and 1877, complaints were made of the insufficient supply of water; and the Company replaced the ¾-inch pipe with a 1-inch pipe. In 1882 there were further complaints, when it was found that, in consequence of

the incline of the main in the Chesterfield Road, the water to a great extent rushed past the branch supply-pipe; and the Company therefore put down a stopcock in the main to diminish the pressure and improve the service. In consequence of increase of business, Poplar Cottage was from time to time enlarged for the accommodation of further patients. At length, in 1879, the Secretary of the Company wrote to Mr. Davis asking him to attend a meeting of Directors with a view to an agreement being come to between them as to the charge to be made for the supply. Of that letter Mr. Davis took no notice; and subsequently he received an intimation that the Company would get the Magistrates to assess the rate. In the December following, they sent in a claim—first for the domestic supply, £4 10s.; and for trade supply, £16. This they claimed for two years—making £41. Mr. Davis did not pay or assent to the claim. The matter was referred to the Company's Solicitors, and at last taken to the County Court, where the Judge suggested a compromise. This was signed by Counsel on both sides, and was to the effect that Mr. Davis should pay £12 a year, and have the use of the water "as heretofore;" and that the terms of the compromise should be embodied in a formal agreement, and executed by the parties to the action. The present proceedings arose out of an attempt on the part of the Company, in drawing the agreement, to limit the use of the water supply to "visitors and patients staying at Poplar Cottage only."

Mr. GRAHAM HASTINGS, Q.C., and Mr. M'CASKIE appeared for the plaintiff; Mr. PHIPSON BEALE, Q.C., and Mr. HEXTALL represented the defendants.

After hearing the evidence and Counsel on both sides,

Justice STIRLING said it was not necessary for him to go into the merits of the dispute beyond deciding the question raised in the action; and at this stage it was sufficient to say that, having gone before the Derbyshire County Court, the action by the Company against Mr. Davis resulted in a compromise, the chief points of which were that judgment was to be entered for the Company with £10 for costs—Mr. Davis undertaking by his Counsel to pay £12 a year for a continuous supply of water at a sufficient pressure through a ¾-inch pipe to be substituted for the existing 1-inch pipe, and being at liberty to use the water for trade and domestic purposes "as heretofore." The supply for additional buildings was to be by future agreement; and the terms of the compromise were to be embodied in a formal deed to be executed by the parties. So far as this agreement had to do with the County Court action, he was not concerned with it. So far as it related to a continuous supply of water, he had not heard it argued; and he left it open for future discussion. But the Court would not order specific performance which would involve the constant supervision of the Court to have carried out. As regarded the execution of the formal agreement, it was one of the things the Court could enforce by way of specific performance. The deed was prepared by the Company's Solicitors, who inserted the words "and for visitors and patients staying at Poplar Cottage only." Those words were struck out by the plaintiff's Solicitors; leaving it "entitled to the same supply of water for the hydropathic establishment at Poplar Cottage as is now being used." By their statement of defence, the Company did not admit the plaintiff's assertion that he had had the use of the water for other persons than visitors and patients staying at the cottage; and they said that, if he had had such uses, it was unknown to them. They thus denied the plaintiff's right to have the use of the water for persons who were not, in the language of the deed, "visitors and patients staying at Poplar Cottage." On this point he had heard evidence, abundant and uncontradicted, that, prior to Feb. 24, 1890, there was substantial user of the water for persons other than visitors and patients staying at Poplar Cottage. Another issue had been suggested —viz., whether the Company knew of it. Upon this he had no difficulty, because the present Secretary stated that five or six years ago his attention was drawn by the Directors to the fact that water was being used for bathing purposes at Poplar Cottage by persons who were not resident there. So that, on the sole issue with which he had to do, he came to the conclusion that the words inserted in the proposed agreement were improperly inserted. Consequently, the defendant Company had been wrong throughout, and the agreement must be executed with the omission of those words; the only alteration being that the words "as now used" should be replaced by the words "prior to Feb. 20, 1890." He should therefore give judgment for the plaintiff, with costs.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, Nov. 8.

(*Before Mr. Justice* WILLS.)

East London Water-Works Company v. Foulkes.

This was an action brought by the plaintiffs to recover arrears of water-rates amounting to £210 17s. due last Christmas, in respect of houses at Stratford and Leytonstone supplied by them.

Mr. FINLAY, Q.C., and Mr. R. M. BRAY appeared for the plaintiffs; Mr. CHANNELL, Q.C., and Mr. RAWLINSON for the defendant.

Mr. FINLAY, in opening the case, said an order had been made by Master Johnson, providing for the trial only of certain questions of law and fact, but referring all matters of detail to be disposed of by an Official Referee afterwards. The action was brought for arrears of water-rates up to Christmas, 1891; and so far as he understood the defence, the points raised seemed to be four. First, the defendant denied his personal liability with respect to some of the houses on which the rates were charged; secondly, he suggested a dispute as to the annual value of the tenements, and that that ought to be settled under the Act, before Justices, as a condition precedent to bringing the action; thirdly, he said the Company were not entitled to charge for baths in the houses; and, fourthly, that he was entitled to some allowance for empties. With regard to the first point, it would be shown that he signed what was known as the "owner's application" for the supply of water to the premises; that the water had been supplied in conformity with such application; that from time to time he had paid rates upon them; and, although raising disputes as to amount, he had never given notice that his ownership had ceased, or that the arrangement under which the water was laid on had come to an end. As to the second point, he should show from the correspondence and otherwise that there never was any dispute as to the annual value—it never arose in any shape or way until after the action; and he submitted there was nothing in it at all. Then, thirdly, with regard to the baths, that depended on the Company's Act, which provided that, in the case of houses under £30 a year rental, to supply water for baths was not to be deemed a supply of water for domestic purposes. For houses over that rental, it seemed to be considered part of the ordinary course of domestic supply to have water for that purpose; and there was a second scale enacted. There was no scale for houses under £30, so that it was really left as matter for agreement; and he should contend that there was a bargain or implied agreement, according to the course of dealing between the parties. The defendant had paid for baths in the course of the dealings between himself and the plaintiff Company; and all that they now asked was that he should go on paying at the same rate as hitherto. With reference to empties, there was a statutory provision that, where the occupation of a house ceased at the middle of a quarter, the liability on the part of the owner paying the water-rate should cease from the end of that quarter. The arrangement, in fact, between the plaintiffs and defendant was one which worked out much in the same way—viz., that they should allow for half the empties. They did not care much which way it should be taken; but it was necessary that a direction should be given to the Referee as to how the account should be treated. The learned Counsel then proceeded to narrate in further detail the facts of the case, stating that the houses in question were situated in Leytonstone; and he handed in a number of applications made by the defendant for water supply. The water was laid on accordingly; and payments were made from time to time by the defendant in respect of all the houses so supplied, with frequent disputes on his part as to the amounts charged. At the end of the year 1888, an interview took place between him and Mr. Jenner, the plaintiffs' collector, when the subject of empties was discussed; and Mr. Jenner agreed, on behalf of the Company, to allow one-half the rate for empties. Upon that, the defendant sent in a list of his houses, marking their weekly rentals; and red-ink figures were appended by the defendant showing the amount of rates charged. It had, however, since been modified in some respects. In the vast majority of cases, the account sent in by the defendant showed that the rate was paid by the landlord; there only being a few houses on a different footing. The present claim against the defendant was in respect of all the houses in that list. The defendant now said there was a dispute as to his being personally liable; but he submitted that these applications put an end to that question. The water was supplied on the defendant's application, on which he described himself as owner; and no notice had ever been sent to the Company that he had ceased to be the owner. With regard to the second point, as to the annual value, the plaintiffs followed the principle laid down by the Legislature and by the Courts for their guidance. They took the amount of the whole year's rent, deducted for insurance, repairs, and so on, and made a certain allowance for loss by change of tenancy. No dispute was ever raised by the defendant as to the assessment with respect to the annual value of his property; but there were frequent disputes between him and the plaintiffs' collector as to the charges to be made for high service, for baths, and for empties. These matters were from time to time arranged—very considerable concessions being made to the defendant. At one interview between him and the Company's collector, the charges for high service and for water-closets were given up. Various letters had passed with reference to the payment of the rates; and finally on July 17, 1889, the defendant wrote enclosing a cheque for the balance due up to June, 1889. Up to that point there was a settlement for the half year; and subsequently the defendant paid after a similar settlement, attended with delays like those referred to in the previous correspondence. The collector and the defendant, after going through the items, settled the amount to be allowed for empties; and the payments were made half yearly after that on such settlement. In June, 1891, there had been considerable delay in getting the defendant to go through the accounts; and on the 9th. of March, Mr. Jenner wrote to him: "I hereby agree to allow empties and overcharges for the Christmas, 1890, water-rates in the usual way on the next settlement instead of this day." Upon that letter, a cheque was given by the defendant. The plaintiffs, of course, admitted their liability to have any errors in respect of that brought into account. It was merely because there had been so much delay in the settlement, that this undertaking was given. The plaintiffs tried in vain to get particulars of the alleged overcharges; and ultimately, as they could not get a settlement, the present action was brought. With reference to all the questions raised, he submitted that the correspondence almost answered the defendant's contentions. He was liable, because he required the water to be laid on as the owner. The jurisdiction was not ousted; because there was no dispute as to the value until after the commencement of the action—in fact, he believed there really was no dispute as to value now. If there were, the jurisdiction of the Court was not ousted where such a dispute was raised after the action was brought.

Mr. CHANNELL said, if it were admitted that the question of value was open to him, he did not care to press the point of jurisdiction. It was not until they got particulars in the action, that they knew how the Company made out their claim; and then they found it was made out wrongly.

Mr. FINLAY submitted that, after all these dealings, going on so long without dispute, the question was not open at all; but if it were, it would have to be disposed of there and not by the magistrates. With regard to the other two points, the defendant was not entitled to demand a supply for baths in houses under £30 rental. If he demanded a supply and got it, it became a supply for other than domestic purposes by agreement; and he must pay according to the course of dealing between the parties, as shown by the various settlements which had taken place. As to the empties, the arrangement made had been to allow one-half the rates for empty houses; and that worked out very fairly to the defendant. That being the basis on which the account had been made up, it was the basis on which the claim should now be dealt with.

Mr. *E. Jenner*, collector to the plaintiff Company, examined by Mr. BRAY, said he had occupied that office for six years. The houses in dispute, except those in Solway Road, were all in his district. The claim was for four quarters ending Christmas, 1891. He had seen the defendant many times on these questions, and had arranged with him from time to time with respect to empties. The amount of rate was settled at the head office. The document of Nov. 12, 1888, was given him by defendant; and the red-ink figures were added by the Company. He sent in accounts from time to time. On May 22, 1890, he received back a demand-note which had been sent to defendant, with corrections upon it with respect to empties. He had not since then had any dispute with defendant as to his being the person liable to pay the rate, or as to the amount of the rate apart from the empties. The practice had been to allow half-rates in respect of empties. In June, 1891, he wrote to defendant, agreeing to allow for any empties on the next settlement, as the list had not been arranged. He repeatedly asked for the list; but had never received it.

Cross-examined by Mr. CHANNELL: The defendant did not say in June, 1889, that he had granted leases of many of the houses, and was no longer the owner. He asked defendant to send a list of the houses he was owner of; and the amount he was willing to pay upon. He knew the defendant's brother was collector of the estate; but never heard that a good many of the leases had been granted to him. The demand-notes did not contain the particulars of the charge, only the figure for each house. They were all based on the figures arrived at in May, 1890, by agreement with the defendant.

Mr. CHANNELL said the fact was that the Company charged these houses at £2 more than they were rated at; and his client had only recently discovered this, and contended he had a right to raise the question. An Act of Parliament had been passed, providing that the parochial rating should be the basis adopted by the Water Companies; but this district was just outside the Metropolitan area, so that it was not conclusive, but only indicated the principle to be adopted. With regard to the ownership, the defendant had parted with some of the property; and he contended that he was not liable to arrears in such rates—the Company being protected by the Act which, while taking away the power of cutting off the water, made such arrears a charge on the property itself. It could be recovered from the occupiers, and deducted from the rent.

His LORDSHIP suggested that it was hardly worth while insisting on this point, as Mr. Channell admitted that it only affected a small portion the property, and a long correspondence had gone on in which it had not been raised. The point, however, was not abandoned by Mr. Channell.

Cross-examination continued: There had never been any dispute with defendant since the list of May, 1890, except in regard to empties. Witness had inserted the word "overcharges" in his letter, agreeing to allow them in the next settlement by error. He had agreed to pay for baths, and had paid for them for three years. [The list referred to showed a division of the charge into two—the bath being separated from the annual rate.] The defendant did not divide the charge with the view to seeing what amount was in dispute.

His LORDSHIP pointed that there were some corrections in the list.

Mr. CHANNELL said no doubt the defendant had paid the charges for baths; but he claimed the right to question it.

Cross-examination continued: It was not his business to find out what houses were empty. They were entitled to charge owners' rates whether or not the houses were empty.

Re-examined by Mr. BRAY: It was agreed that the defendant should send in a list of empties, which the Company accepted, and half the rates were allowed.

Mr. *Jones*, Chief Clerk at the East London Water Company's office, said the application forms were sent to the inspectors to deal with. The rule was not to give orders for the water to be laid on until application forms had been received. The forms produced were the only ones which could be found with regard to defendant's houses.

Mr. BRAY said that was his case, subject to calling Mr. Crookenden, the Secretary (who was not then in Court), who had had some interviews with the defendant.

Mr. CHANNELL said the question of personal liability was one of principle. It was not the most important point in the case; but it was a part of it. In a great many cases leases had been granted; and in some of those, the defendant had lent money on mortgage, and was now mortgagee in possession. In respect of those, he did not deny his liability. A great many of the houses, however, were the property of his brother; and as he had the opportunity of settling accounts with him, he had paid the water-rates. But he submitted that there was no estoppel; and as the Company had chosen to sue him, he was entitled to raise the point. The chief importance of it would be in deciding whether the amount paid into Court was sufficient.

Justice WILLS said the real question was whether there was not an estoppel by the defendant's course of conduct.

Mr. CHANNELL said the defendant was not bound to give notice to the Company when he ceased to be owner; and he submitted also that the plaintiffs ought to have pleaded estoppel, if they meant to rely on it. With regard to the annual value, it was true that that point had not been put prominently forward by the defendant; but that was because he did not know the principle on which he was being charged, which he only ascertained from the affidavits made in the action. He contended, therefore, that he was entitled to have the question gone into; and he should ask his Lordship to state the principle on which the Referee should act. With regard to the empties also, he did not seek to re-open accounts which had been settled; but he was entitled now they were before the Court to have the principle settled on which allowance should be made.

Mr. BRAY said the Company did not object to the allowance for empties being made in strict conformity with the statute, if the defendant preferred it.

His LORDSHIP said, if there had been a compromise before, of course the defendant was not bound by it for all time; he might give it up, and stand on his strict rights.

Mr. CHANNELL then dealt with the question of baths, as to which he said the defendant had never agreed to the charge made. Sometimes he had paid it, but he always objected to it; and he believed that, as a rule, the Company did not charge for baths in houses of which the rental was less than £30.

Mr. *H. C. Foulkes*, the defendant, examined by Mr. RAWLINSON, said he was the owner of the estate in question; but he was now freeholder of not half the whole number of houses. He had made out a list of those not belonging to him. Most of these were the property of his brother; and some of the deeds were in Court. He told Mr. Jenner on several occasions that he was not the owner; but that he paid the water-rates on his brother's houses for convenience. He mentioned the fact to him in June, 1891; and it was then he gave him the letter agreeing to allow empties and overcharges. Most of the application forms were signed by his brother; and those produced applied to less than half the houses in question. These forms were filled up in a hap-hazard fashion, in order to get the water laid on. The allowance with regard to empties was——

Mr. BRAY suggested it was not necessary now to go into this point; and Mr. RAWLINSON agreed, if it was understood that the Referee should go into it on the statutory basis.

Examination continued: He had complained to Mr. Jenner that the houses were rated too highly. Since the action, he had gone through the list, and had given plaintiffs particulars of the difference between the rate they charged and that charged by the parochial authorities. In almost all cases, the Company's charge was higher. He discussed the question of baths on several occasions, especially in June, 1890; but he never agreed on the price to be paid for them.

Cross-examined by Mr. BRAY: He had paid 4s. for each bath down to May, 1891. He had never given notice to discontinue the bath supply. In June, 1891, he told Mr. Jenner that he was not liable for the baths. He did not think there was any objection raised by letter to the charge for baths after 1889. In November, 1888, he sent in the statement produced; he had no knowledge of the red-ink figures. After that date, he could not say whether the Company's demand was reduced, but he would take it so. He did not agree with the figures. Mr. Jenner asked for details of the estate; and he got them out for him. The question of value did not come up again until June, 1891, when he disputed the charges generally and specifically; ultimately paying the charge made, on the undertaking to allow overcharges and empties. He paid the water-rates on his brother's houses for convenience. He believed he was not rated for them by the parish, though he paid the rates. He applied to compound for the rates of the houses in Goodall Road.

His LORDSHIP said it was not necessary to pursue that. It was quite clear there was an estoppel as to the ownership.

Re-examined: He had one or two interviews with the Secretary as to the basis of charge. It appeared reasonable, on the face of it; but he subsequently wrote and said he did not agree to it. The Secretary said they were entitled to charge 4s. for baths, for all houses up to £50 a year.

Mr. *Slingsby*, examined by Mr. CHANNELL, said he was clerk to the defendant. He was present on the occasion when Mr. Jenner came about the water-rates; the discussion resulted in payment of the full amount, and a letter being given by Mr. Jenner. Prior to the arrangement being come to, Mr. Foulkes raised a question about the baths, the high service, and empties. He believed the matter of annual value was also mentioned.

Cross-examined: He could not remember anything that was said about annual value.

Mr. CHANNELL having summed up the defendant's case; and Mr. FINLAY having been heard in reply,

Justice WILLS delivered judgment. He said the case raised questions of more or less difficulty. The first point was whether the contention as to ownership of part of the property was open to the defendant; and whether he was at liberty, after what had taken place, to set up a plea that he was not the owner of part of the property, and therefore not liable. He was of opinion that the defendant had precluded himself from taking that ground, having dealt with the Company on the footing of being the owner, and thus prevented them from being placed in the same position that they were in when the dispute first arose. Without saying there was any obligation cast upon the defendant by Act of Parliament, to give notice of change of ownership, yet, when knowing he was not the owner he dealt with them as the owner, he must be taken to have done so with them on this footing. The next question was as to annual value. On this, he was clear there was no dispute within the meaning of the section which referred it to the Justices until the action was brought; and therefore the action was not concluded by reason of the matter not having been settled by the Justices. There being nothing in the nature of estoppel het Official Referee must inquire what the annual value was, and see whether there was any reason to correct the demand in respect of that item. As to empties, there was now no dispute. The defendant was entitled to have the matter inquired into by the Referee, and to have the proper allowance made. The only remaining matter was whether the Company were entitled to sue for a *quantum meruit* in respect of baths, or to have an agreed sum. He thought there had been an agreement to pay 4s. per bath; and the accounts had been made out by the defendant on this footing The question of whether this amount was too much, would be open to the Referee. Water companies were not bound to supply water for baths to houses rated under £30, unless they were paid for it. Seeing that 4s. was the lowest price which the Act fixed in respect of houses rated between £30 and £50, he thought this was a fair *primâ facie* test for a house under £30. The evidence as to what was a fair charge, was not before the Court; and therefore he did not express any opinion upon the point. The Official Referee, however, might take that as a fair starting-point, and inquire whether there was any reason for cutting the sum down for houses rated under £30. The rest of the action would be dealt with by the Official Referee.

Driving Dynamos with the Waste Heat from Gas-Retorts.—In connection with the electric light installation at Nelson, it is intended to utilize the waste heat from the retorts at the gas-works to generate the steam power for driving the dynamos. The installation is to consist of 600 lamps of 16-candle power each; and a pressure of 80 lbs. will be required.

MISCELLANEOUS NEWS.

THE SHEFFIELD TOWN COUNCIL AND THE GAS COMPANY'S PROVISIONAL ORDER.

As already stated in these columns, the Sheffield Gas Company are proposing to make application for a Provisional Order to give them powers, *inter alia*, with reference to the testing of the gas, and to create and issue further debenture stock. The provisions of the proposed Order have been subjected to careful examination by the Parliamentary Committee of the Town Council; and a summary of their proceedings in connection with the matter has been published by a local paper.

It appears that the first four clauses of the Order simply deal with the title, and other points with which the Committee are little concerned. By the fifth clause, the Company ask to be authorized to construct additional works; and to this the Committee assent. By the Company's Act of 1866, the quality of the gas they supply has to be equal to the light of "an Argand burner having 15 holes and a 7-inch chimney." The sixth clause proposes that the quality should be equal to "a Sugg's 'London' Argand burner No. 1, having 24 holes, each hole of 0·045 of an inch in diameter, with a glass chimney 6 inches long and 1 7-8ths of an inch in diameter." The Committee recommend that Mr. W. J. Dibdin, Gas Examiner to the London County Council, should be asked to advise the Committee on this clause, and whether there would be the same illuminating power from the gas with the proposed 16½ candles' test as by the present 15; and whether worse gas could be supplied through the new burner, to the injury of ceilings, &c., although of full illuminating power. The Company ask by clause 7 to be allowed to create and issue debenture stock to the amount of £289,494. The Committee, at their meeting on the 13th ult., recommended that it should be made a condition of the Corporation assenting to the Provisional Order that it should contain clauses giving the Corporation the option at any time hereafter of purchasing the undertaking of the Gas Company upon terms to be agreed upon by the Corporation and the Company, or, failing agreement, to be settled by arbitration. At a meeting of the Committee on the 21st ult., Sir F. T. Mappin, M.P., the Chairman of the Company, and Mr. Hanbury Thomas, the General Manager, attended as a deputation before the Committee, and stated that the Company declined to consent to the insertion in the proposed Order of any clause giving the Corporation the option at any time hereafter of purchasing the undertaking. The deputation also gave information as to certain clauses contained in the Order. Thereupon it was moved and seconded—"That the Council be recommended to consent to clause 7 of the Provisional Order, provided that the amount of the debenture stock to be issued be reduced from £289,494 to £200,000." An amendment was proposed—"That the amount of the debenture stock be reduced from £289,494 to £150,000." The amendment, however, was negatived; and the motion was agreed to. Clause 8 put the rate of interest to be paid on the debenture stock so created at 5 per cent.; and the Committee recommend that the rate of interest shall be 4 per cent. They approved of clause 9, limiting the amount of debenture stock to £50,000 to be issued at one time, and providing that six months shall elapse between one issue and another. The Committee also approved of clause 10, which applies any premium arising on the issue of debenture stock in the same manner as the money raised by the stock itself, but not to be entitled to interest. By clause 11, the Company propose to offer the debenture stock either by auction or tender; but the Committee recommend that the power to sell by tender shall be eliminated. The remaining clauses deal with the mode of paying interest on the debenture stock, the application of the money, and other details, to none of which the Committee appeared to have raised any objection.

At a meeting of the Committee on the 4th inst., the following important letter, addressed to the Town Clerk (Mr. J. W. Pye-Smith), was laid before them:—

Oct. 31, 1892.

Dear Sir,—We have to acknowledge the receipt of your letter of the 26th inst., returning a copy of the proposed Provisional Order, as altered by the Parliamentary Committee of the Town Council; and we observe, with surprise, you state that the proposed alterations are in addition to a condition (named in your previous letter of the 18th inst.) "that the Order should contain provisions giving the Corporation the option, at any time hereafter, to purchase the undertaking of the Gas Company, upon terms to be agreed upon between the Company and the Corporation, or, failing agreement, to be settled by arbitration."

The Chairman of the Company and the General Manager saw the Parliamentary Committee on the 21st inst. with reference to this suggested provision; and we are now instructed to confirm the statement the Chairman then made—that the Company could not consent to any such provision being included in the Order, and that if it be insisted on, they would feel themselves compelled to withdraw the Order, except so far as it relates to the erection of works on the additional land at Grimesthorpe, recently purchased from Earl Fitzwilliam.

We are further instructed to point out that, if the Company do not obtain power to raise capital by debenture stock, they will have no option but to call up their 10 per cent. share capital, with the probability that, should coal not be considerably reduced, and residuals improve materially in value, the price of gas, which it has always been the object of the Company to keep as low as possible, will have to be advanced, the responsibility for which will rest upon the Corporation, should the Corporation, by withholding their consent to the Provisional Order, debar the Company from obtaining money at a cheaper rate.

We see no reason why the debenture stock should not be offered by tender as well as by auction. In either case, it would go to the highest bidder; and, by inviting tenders, the Company would probably obtain offers from various parts of the kingdom, with the result that the stock might be sold at higher prices than would be obtained at auctions, which would most likely only be attended by parties resident in or near Sheffield. With the above exceptions, the Company are willing to agree to the alterations made by your Committee in the printed copy of the proposed Order.—Yours truly,

WAKE AND SONS.

The Committee, after hearing this very strong objection of the Gas Company to the condition mentioned by them in their resolution of the 13th ult., as to the purchase of the undertaking, resolved not to press that recommendation for acceptance by the Council. The Committee came to this conclusion on the understanding that the Gas Company will not attempt to call up their remaining 10 per cent. capital until they have exhausted the borrowing powers they are seeking to obtain by the Provisional Order, or until they are able to call up such capital and pay 10 per cent. upon it without increasing the price of gas.

At the Meeting of the Town Council on Wednesday, the minutes submitted by the Parliamentary Committee embraced a recommendation that the Council assent to the Gas Company's Provisional Order on certain conditions.

The TOWN CLERK first read a letter from Messrs. Wake and Sons, in which they stated that, if the Company had to abandon that portion of the Order which related to the borrowing powers, the price of gas would, no doubt, in the near future, have to be advanced. This being so, the Town Council would be solely accountable for it.

Alderman CLEGG, in moving the adoption of the minutes, explained that it would not have been necessary for the Company to come to the Town Council but for the powers asked for to construct additional works at Grimesthorpe and to alter the method of testing the gas. The Company, however, also sought power to create debenture stock to the amount of £289,494. It was originally proposed that this stock should be issued at 5 per cent. But the Parliamentary Committee had cut down the amount to £200,000, and the rate of interest to 4 per cent.; and they proposed that the amount should be raised by auction and not by tender. The Committee had considered the various matters seriously; and, on the whole, he thought the Company's proposal a fair one, which the Corporation would have done well to have accepted as it stood. Five per cent. seemed a high rate of interest to pay; but if the stock were issued by auction, it would probably sell at 140, so that the buyers would obtain something like 3½ per cent. The most important point was this—that the Company had now called up the whole of their capital, except about £120,000. If they called up that, they would have to pay 10 per cent. upon it; whereas, by the adoption of the course they proposed, they would get the money at 3½ per cent., which, of course, was to the advantage of the gas consumers, who, if the Company were compelled to pay the higher rate of dividend, would bear the burden in the increased price of gas. The Committee resolved to approve of the Order, subject to the understanding that the Company would not attempt to call up the remaining 10 per cent. capital until after they had exhausted the borrowing powers sought in the Order, or until the 10 per cent. could be paid without increasing the price of gas. The letter which the Town Clerk had just read was to the effect that the Directors could not make that promise. They were, in fact, unable to make any such promise which would bind their successors, but that was the intention they had expressed. After the receipt of the letter, however, he saw Mr. Hanbury Thomas and Mr. Wake; and, failing to get any withdrawal from them, he went to Sir Frederick Mappin, but with no better success. The position, therefore, was that, if the Council refused to assent to the Order, the Company could either withdraw the money clauses, which would render an increase in the price of gas inevitable, or they could go to the Board of Trade, who might grant the powers in spite of the Council's opposition. Under the circumstances, he moved the adoption of the minutes. But he did not agree with the last clause, as to the understanding on which consent was to be given; and he hoped someone would move its omission.

Alderman BRAMLEY seconded the motion.

Mr. STYRING moved an amendment to limit the borrowing powers to £150,000, instead of £200,000. He urged that, if the Council sanctioned the larger figure, with the £120,000 of the present authorized capital, the Company would have borrowing powers to the extent of £320,000. As the average capital expenditure of the Company for the past 15 years was £10,500, this would carry them on for a period of 30 years. He ventured to submit that the policy of the Council was to keep as much control over the gas undertaking as possible; and, though some might talk of gas as being a doomed light, to see that the Corporation were in a position, should it at any time be thought desirable, to acquire the works.

Mr. BENNETT considered that this was perhaps the most important question that had been brought before the Council since the purchase of the water undertaking. He did not think that any opportunity ought to be neglected to obtain greater control over the Gas Company than the Council had at present. Personally, he was opposed to giving the Company any increased power for borrowing at all. He would let them call up all their capital, increase the price of gas, and raise the opposition there would be in the town. Then the ratepayers might discuss the question of purchasing the undertaking.

Alderman FOSTER said he agreed with the Company's proposal to raise the money in the way of cheap capital, because this was for the advantage of the town; but he should like an undertaking that that plan would be carried out.

Alderman FRANKLIN thought the proposed reduction from £200,000 to £150,000 was too paltry for the Council to consider; and he, therefore, suggested that the amendment should be negatived, and that the proposals made by the Company should only be assented to on the conditions laid down by the Committee, which he thought were very reasonable and satisfactory.

Mr. J. EATON urged that the Council should at once take some steps with a view of purchasing the gas undertaking.

Alderman GAINSFORD said it seemed to him that the letter from the Solicitors to the Company contained a threat of a serious nature—that, if the Corporation would not retrace their steps and withdraw their resolution, the Company would withdraw their application for a Provisional Order, and, as a consequence, the price of gas must be raised; and that the Corporation alone, not the Company, would be responsible for that catastrophe. It seemed to him that the responsibility would rest upon the party which was unreasonable, and caused the failure of the negotiations. They were at this moment in a very serious position with regard to the Gas Company; and, if they were threatened with a rise in the price of gas, he was not at all sure that

the proper answer would not be that the Corporation should put themselves in a position to apply for powers to purchase the gas-works. If the Town Clerk gave the requisite notices for purchase at once, they would be in time for next session. It seemed to him that this would be the proper answer to the Company.

The Town Clerk pointed out that the Council had not the ghost of a chance of compelling an unwilling Company to sell, even if they went to Parliament next session.

Alderman Clegg replied upon the various points raised in the discussion, and said he was prepared to take the word of the Directors of the Company that they would carry out the arrangement to which reference had been made.

The amendment was then put and lost.

Mr. H. W. Chambers moved a second amendment, to the effect that the resolution of the Committee with reference to the uncalled-up 10 per cent. capital of the Company be not confirmed. In support of the amendment, he pointed out that the Directors of the Company were in the position of trustees, and that they had no right to give a pledge binding either themselves or their shareholders.

After further discussion, this amendment was also negatived; and the minutes were then confirmed.

A LARGE GASHOLDER FOR BRISTOL.

Last Tuesday afternoon, Mrs. Dix, wife of the Chairman of the Bristol Gas Company, laid the first stone of a large gasholder tank to be constructed at Barton Hill in connection with that Company's works. The tank is being carried out to the drawings and specification of Mr. G. C. Trewby, of The Gaslight and Coke Company, and under the supervision of Mr. W. Fiddes, the Engineer of the Bristol Company—the contractors being Messrs. John Aird and Sons. A large company assembled to witness the ceremony, which was commenced by Mr. Trewby giving a brief description of the proposed holder; and Mr. John Aird, M.P., followed with an account of the contractors' part of the work. This gentleman then presented Mrs. Dix with a silver trowel, and asked her to lay the first stone of the tank. This she did in a graceful and effective manner. The company and the workmen engaged (the latter numbering 247) were then photographed; after which, on the invitation of Messrs. Aird, the Directors, officials, and visitors lunched at the Royal Hotel. A few toasts were proposed; one of them being "The Bristol Gas Company." Mr. J. W. S. Dix, in responding, observed that the new holder would have a capacity of 5,500,000 cubic feet. The increase in the consumption of gas from 1861 to 1891 was 329 per cent.; and at the present time the Company had storeage for 8,000,000 cubic feet. When the new gasholder was completed, that capacity would be increased to 13,500,000 feet. All this progress was being made in spite of electricity; and he believed that the demand for gas would continue to extend.

A few particulars regarding the construction of the tank will no doubt be interesting. It is to be built entirely of pennant stone, rendered with cement. Its diameter is to be 222 ft. 6 in.; and its depth from the top of the coping to the rest stones at the bottom, 50 feet. The walls are to be 5 feet thick at the bottom, setting off on the outside until they become 3 feet thick at the top; the intervening spaces between the excavation being filled with concrete. It is to have 25 counterfort piers for the columns; and 100 block stones at the bottom for the gasholder to rest upon. Each pier will be surmounted by a stone 7 feet square; and, when finished, its coping will stand 6 feet above that of the adjoining tank, with a backing of earthwork surrounding it. The confined space in which the excavation has had to be made, and the close proximity to the adjoining gasholder tank and to the public road, rendered the excavation for the tank a work of very considerable difficulty; and therefore the core, which has to be excavated to a depth of 9 feet, has been left for the present, in order to utilize it as a place for the storeage of materials, and as a position from which the locomotive steam-cranes could be worked. The excavation, on account of the varying nature of the ground, is closely timbered, excepting where the rock occurs—viz., at 6 feet below the surface, where it is 16 feet thick, followed by 14 feet of marl, one foot of sand (reserved for the rendering), 5 feet of rock, and 4 feet of marl, upon which soil the masonry of the tank is founded. The excavation of the trench (which was commenced on July 18 last, and is now completed ready for the masonry of the tank) is 232 feet in diameter and 46 feet deep in the soil, and 20 feet in width. About 32,000 cartloads of earthwork have been removed up to the present time, which has kept 60 horses and carts, six locomotive steam-cranes, three portable steam-engines, four boilers, six steam rock-drills, and 240 men in constant employment. The timbering in the excavation comprises 36,361 superficial feet of poling board and 15,620 cubic feet of struts. The timber framing upon the core necessary for supporting the steel crown sheeting of the gasholder will consist of 425 10-inch butt fir poles, 27 feet long, which will carry a domed superstructure framing of timber 9 in. by 2½ in.; and, for securing the same, 30 tons of castings will be used. But a little more than three months have elapsed since Messrs. Aird commenced the work; and it is anticipated that the tank will be completed in June next, when the erection of the gasholder, which it is designed to contain, will be begun. To fill the tank, 5 million gallons of water will be required.

Electric Lighting at Bowden and Altrincham.—At meetings of the Local Boards interested, on Monday of last week, provisional agreements were come to with the Swan-Edison Electric Light Company for lighting the whole district of Bowden and Altrincham.

Slough Gas Company.—The half-yearly meeting of this Company was held last Tuesday week. The report stated that the result of the working had been satisfactory, and enabled the Directors, after providing for the interest on debentures, to recommend the payment of the usual dividends (10 per cent. on the old capital, 7 per cent. on the new, and 6 per cent. on the preference shares). The amount received for gas during the six months was £1962; and for residual products, £326. The profit was £693. The report was unanimously adopted.

INCREASED STOREAGE AT THE CARLISLE GAS-WORKS.

On Monday last week, the Gas Committee of the Carlisle Corporation inspected the last extension to the gas-works of the city, by which the storeage capacity of the gasholder at Boustead's Grassing has been increased from 640,313 to 1,020,000 cubic feet, at a cost of about £3000. Reference to the work has already been made in the Journal. Those present included Mr. R. Forster (Chairman of the Committee), Mr. J. Hepworth, M.Inst.C.E. (Gas and Water Engineer), and Mr. Glover (Assistant Manager). The Town Clerk (Mr. A. H. Collingwood) was also in attendance. The site was acquired after some railway alterations were carried out in 1878; and six acres of land were set aside for the purpose of making such extensions as might be found necessary from time to time. Upon that land, in 1878-9, No. 4 gasholder (the one which has just been enlarged) was erected by Messrs. Ashmore and While, of Stockton-on-Tees; and shortly after that time, works were erected for the treatment of residual products, including the manufacture of sulphate of ammonia and sulphuric acid. The extension just inspected was carried out by Messrs. Ashmore, Benson, Pease, and Co., Limited, the amount of whose contract was £2719. The plans and specifications were prepared by Mr. Hepworth, under whose supervision the original holder was constructed. The enlargement consists of the addition of a third lift to the holder. It is 122 feet in diameter by 30 feet deep; and the columns and framing have been heightened 30 feet to meet the requirements of the extra lift. The design and mode of construction of the original holder have been strictly followed; and the extended holder is to all appearance one homogeneous work. The weight of materials used in the extension was about 100 tons of wrought iron, 83 tons of cast iron, and 1 ton of Bessemer steel.

In connection with the new work, some particulars as to the development of the consumption of gas in Carlisle may not be out of place. Twenty years ago the gasholders erected at the works adjoining the Viaduct were three in number. The largest had a storeage capacity of only 130,000 cubic feet; and the total of the three holders at that time did not exceed 300,000 cubic feet, or about one-fifth of that at present existing. The capacity of the three holders adjoining the Viaduct is now equal to 430,000 cubic feet, and that of the extended holder at Boustead's Grassing, 1,020,000 cubic feet. Great as the increase in the storeage has been, it is not even now much in excess of the maximum daily consumption, which is equal to 1,250,000 cubic feet; and the probability is that the Gas Committee will be called upon, in the course of two or three years, to make further extensions in their holders. For lighting purposes, the increase in the consumption of gas in the city is steady and continuous; but perhaps the chief cause of the rapid and considerable augmentation in recent years is attributable to the development of its use for cookers, fires, gas-engines, workshop appliances, &c. There is no doubt also that the policy of the Gas Committee in selling gas at a low price has been an important factor in producing the present satisfactory demand for gas for all purposes.

After the inspection, the Chairman of the Gas Committee made a few observations. He said he remembered taking part 14 years ago in the inauguration of the previous holder. It was capable of containing upwards of 600,000 cubic feet of gas; and it was thought at the time that it would suffice for many years. Fourteen years had passed; and now they had had to make the present extension. The whole work was a credit to the engineering skill of Mr. Hepworth. If the consumption continued to increase as it had done, they would, in the course of a few years, have to erect another holder, which would probably cost £14,000 or £18,000. The tank of the extended holder was almost the first concrete tank constructed. It had been a great success; and he believed that all tanks of any size would be made of this material. It had proved to be an excellent tank. When it was formed, it gave Mr. Hepworth many a sleepless night—the Gas Committee having unfortunately accepted the lowest tender, which the contractor could not carry out. If he were a member of the Committee when the next holder was needed, he would not be an advocate for "economy" of that kind.

In a report made by Mr. Hepworth, the new extension was fully described. It stated, among other things, that the operations for extending the holder were commenced on June 16 last by pumping the water both from the tank and from a well outside. While the operations were in progress, the River Caldew was frequently in flood; and the pumping was attended with considerable anxiety. During the whole time two pumps, and during part of the time three, were constantly working. The total quantity of water drawn off was about 37 million gallons. These arrangements were not included in the contract, and were carried out by the Committee's own staff. The contractors for the holder commenced operations on July 13, and completed their work on the 26th of October. The gasholder, having been carefully tested, was found to act with the least possible friction. Every part was true; and no leakage occurred from any of the joints. The whole work had been carried out most satisfactorily by the contractors.

DUNEDIN SUBURBAN GAS COMPANY, LIMITED.

The Second Annual General Meeting of this Company was held last Thursday, at the London Offices, No. 2, East India Avenue, E.C.—Mr. F. Dutton in the chair.

The Secretary read the notice convening the meeting; and the Directors' report and the accounts for the year ending June 30 last were taken as read. The revenue account showed total receipts amounting to £3376, of which gas had yielded £2881; residuals, £455; sundries, £33; and the interest account, about £6. The expenditure amounted to £3282—leaving a profit of £94.

The Chairman, in moving the adoption of the report and accounts, said the result of the working during the past year exhibited a slight improvement over the preceding twelve months, as they were able to show a small profit as against a debit loss of £316 at June 30, 1891. The Directors would have been very pleased if they could have placed before the shareholders a still more substantial result than this. However, he hoped that, as Dunedin grew, the Company's business

would also expand. As stated in the report, he had recently had the advantage of paying a visit to Dunedin, and of being able to give some attention to the Company's affairs and prospects there. He was glad to be in a position to assure the shareholders, as the result of his observations, that they unquestionably possessed very substantial and high-class works, capable of doing a much larger volume of business than they were at present. The reason of the smallness of the business was that the development of Dunedin had not proceeded so rapidly as the founder of the works originally contemplated. At that time, Dunedin was generally admitted to be the most prosperous town in New Zealand; but depression fell upon the colony, from which it was only now beginning to emerge. The consequence had been that the suburban districts the Company served had felt the want of progress much more than one could see evidence of in the town itself. So far as the figures in the accounts conveyed any indication; there were signs of an improvement. The revenue from all sources was £250 more than in the preceding year; while, on the other hand, the expenditure showed a slight diminution. At the time of the last meeting, in consequence of the death of Mr. Daley, who had faithfully served the Company as Engineer and Manager for several years, it had become necessary to send out a successor, and they appointed Mr. W. J. Canning, in whom they had found a most energetic and trustworthy representative. As to the future, he mentioned that they were now endeavouring to extend the business by developing the use of gas stoves and other domestic appliances. When he (the Chairman) was in Dunedin surveying the general surroundings of their works, it struck him very forcibly that what they really wanted was a closer-lying population; and as he looked down on Dunedin from the Caversham Hill, where their works were situated, the idea occurred to him at once that the district known as South Dunedin was one which should be included in the Company's area of supply. The district was at present served by the Corporation; but, on the expiration of the contract for lighting, that would be a field which the Directors would consider was legitimately open for them to secure.

Mr. A. CAMPBELL seconded the motion, which was unanimously carried.

The Auditor (Mr. W. Stansfield) having been reappointed,

On the motion of Mr. HESELTINE, seconded by Mr. F. M. DUTTON, a resolution was passed, thanking the Directors for their services.

The proceedings then terminated.

OPENING OF THE GODSTONE GAS-WORKS.

The Godstone Gas-Works were opened on Saturday, the 5th inst., to supply gas to the inhabitants of the neighbourhood, and also Blindley Heath. The works, which were designed by Mr. Robert Fish, Assoc.M.Inst.C.E., of 5, Great Winchester Street, E.C., are at present equal to an output of 4,500,000 cubic feet of gas per annum; and they are so arranged that at any time an extension can easily be made to meet a much larger consumption. They are erected on a well-chosen site, comprising two acres of freehold land adjoining the Tunbridge line of the South-Eastern Railway; thus affording easy facilities for the conveyance of coal into the works. The tank, buildings, and office, which were erected by Mr. Hitchcock, a local builder of Godstone, are well proportioned, and laid out with good taste. They are faced with red kiln bricks. The retort-benches, condenser, scrubber, purifiers, and gasholder are very subtantial, and were erected by Messrs. Edward Cockey and Sons, Limited, of Frome. The cast-iron mains (which are all coated with Dr. A. Smith's solution) were supplied by the Stanton Iron-Works Company, Limited, near Nottingham, and were laid, under Mr. Fish's direction, at a depth of not less than 2 feet from the surface of the ground to the top of the pipe, in order to protect them from the effects of the steam-roller. All the pipes were tested up to ten times more than the ordinary pressure of the gas, before filling in the ground, so that the loss by leakage must consequently be very small. A Bill confirming the Company's Provisional Order received the Royal Assent during the session 1890-91. The limits of supply comprise an important and extensive area, lying between the Redhill Gas Company's district on the west, that of the Oxted Gas Company on the east, and running south beyond the Bellaggio to within the limits of the East Grinstead Gas Company. The Company's works erected at Lingfield to supply this place and Dormans, have been in operation upwards of a year. Many of the consumers are already using cooking stoves, which are let out on hire; and the working results have, we understand, proved generally satisfactory. The price charged for gas is 5s. per 1000 cubic feet; and there are no meter-rents. The Company also provide and lay a service-pipe to each house free of charge for 60 feet from the street-main; but where a longer service is required, the consumer will only be charged the actual cost.

A COLLIERY OWNER ON GAS COAL CONTRACTS.

Alderman Gainsford, Managing Director of the Birley Collieries, near Sheffield, presided yesterday week at a meeting held in connection with the Yorkshire Miners' Association. In the course of his remarks, he alluded to the recent contracts which had been made by coalowners with the Leeds and Birmingham Corporation Gas Committees, and said he entirely agreed with Mr. Pickard, and, with him, deprecated the action which had been taken by those Committees (see *ante*, p. 779). He denounced even more strongly the action of those coalowners who had been so foolish and so wrong as to allow themselves to become the victims of those Committees, and promised that not a ton of Birley coal should go to either Birmingham or Leeds. If Gas Committees, who were servants of the ratepayers, a great majority of whom were working men, persisted in being so foolish as to try to sweat the coal trade, the question would arise whether the workmen of such towns as Birmingham and Leeds would be content to see their power used to sweat their brethren at a little distance from them. Then there was the question whether the workmen engaged in the coal trade would be content to go on working at collieries where the owners were foolish enough to allow themselves to become victims of such sweating. There was now a much greater approach to unity between different interests in the coal trade than some time ago; and he suggested the formation of a joint committee or joint association of coal-owners and of coal-workers, to take cognizance of such matters as those to which he had referred. Any reduction in the present price of coal was, in his opinion, totally unnecessary for the welfare of the country, and quite uncalled for in the interests of the trade. Generally, any reduction of wages would do more harm than good; and he would rather see the 10 per cent. taken off in Durham put on again, than see a reduction of 10 per cent. in the Yorkshire district. Mr. Cowey, the President of the Association, said he had the names of all the collieries that had accepted a reduction in prices; and, if they attempted to touch the men's wages, they would have to fight every inch of the ground.

The Kirkleatham Water Arbitration Award.—The Stockton and Middlesbrough Water Board have approved of the officials of the Board refusing to accept the sum of £8006 tendered in August last by the Kirkleatham Local Board as the sum payable to the Water Board, in pursuance of the award of Mr. Henry Law and the order of the High Court of Justice, for the water-mains, &c., in the Kirkleatham district; and the requisite steps have been taken to appeal against the judgment of the Divisional Court.

The Price of Gas at Preston.—The owners of gas-engines in Preston have failed in their endeavour to secure a reduction in the price of gas; the Directors of the Gas Company replying to the request conveyed to them in the recent interview with the Secretary (Mr. H. Green) by saying that they cannot see their way to depart from the present position of charging a uniform rate. At a meeting of the gas-engine owners held last Tuesday night, a resolution was passed expressing regret at the decision, and stating the belief that it will have the effect of preventing an extension of the use of gas for power purposes.

Buenos Ayres (New) Gas Company, Limited.—The Secretary of this Company (Mr. E. W. Layton) has issued to the shareholders a circular in which it is stated that, the accounts for the six months ended June 30 last having now been completed, the Directors are pleased to report that a marked improvement has taken place in the results obtained over the corresponding period of the previous year, and that a small profit is shown to have been earned after payment of the debenture interest and all standing charges. The number of private consumers continues to steadily increase; and efforts are still being made, with some prospect of success, to improve the conditions on which the public lighting is being carried out. The political and financial position of the country shows encouraging signs of improvement. The premium on gold during the period under review fell from 273 to 210, whereby a considerable saving in remittances from Buenos Ayres was effected. Should this reduction be maintained, the Directors are encouraged to hope that the Company will appreciably approach towards its earlier financial position, and that a moderate dividend may yet be earned on the working of the full financial year. In the absence of an interim dividend, the Board believe that the foregoing statement will prove of interest to the shareholders.

The Quality of the South London Water Supply.—At the meeting of the St. Saviour's Board of Works last Wednesday, a report from the Medical Officer of Health (Dr. R. Bodmer) on the water supply, was received. The report stated that samples of water taken from the mains of the Southwark and Vauxhall and Lambeth Water Companies on Oct. 17 had been analyzed. In comparison with an analysis made on Sept. 5, there was a trifling improvement in the former Company's sample; but the Lambeth sample was almost identical with that taken in September of the same Company's water. He was of opinion that both the samples were still of an unsatisfactory quality. It was resolved to address a letter to the County Council, asking them to insert a clause in their next Bill authorizing them to appoint inspectors to regularly inspect the Water Companies' filter-beds and works, and also all water-courses running into the river above the intakes of the Companies. A letter was read from General Scott, on behalf of the Local Government Board, appointing a time for taking further samples of the water supplied by the two Companies in question—notice to be given to the Companies of the time and place. Several members of the Board thought the only fair way would be to take samples unexpectedly; and it was resolved to write the Local Government Board to this effect.

Contractors' Responsibilities.—In the Queen's Bench Division of the High Court of Justice, Mr. Baron Pollock and Mr. Justice Hawkins tried an action brought by a contractor against the Corporation of Workington, by whom he had been employed under a contract to construct a system of sewers in the town. This contract he had thrown up, in consequence, as he said, of the work turning out to be impracticable by reason of water in the soil; and he sought to recover a sum of upwards of £7000. There was no certificate, however, under the contract. The case had been referred to Mr. Hemming, Q.C., the Official Referee, who had given judgment for the Corporation; and against this the contractor appealed. After a long argument, the Court came to the conclusion that they could not disturb the decision of the Referee. Mr. Baron Pollock, in giving judgment, said he could have wished that, by some arrangement, a more equitable ending of the case might have been arrived at; but there was no ground for setting aside the decision. The parties had entered into the contract under the belief that it could be carried out; but it had turned out that, by reason of the character of the soil and the water in it, it could not. The contractor suggested certain modifications, which were declined; and then he threw up the work. And, in fact, no certificate of the engineer had been given. Under these circumstances, it was impossible that the contractor could recover the sum stipulated by the contract to be paid upon its completion. Nor was there any other ground on which he could be entitled to recover. There was no evidence of collusion between the Corporation and the Engineer who had refused his certificate, which was a condition precedent to any right to recover under the contract. Mr. Justice Hawkins concurred. The appeal was therefore dismissed.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Per your favour, I have been permitted to see the proof-sheets of a description of the new oil-gas plant, which has been devised by Mr. W. Young, of Peebles. The article is given opportunely; for now that Mr. Young has established his invention, it is desirable that gas managers should be informed of it. I presume the description of it will come as a surprise to many. In my isolated position, I am not able to say what experimenters may have done in endeavouring to master the problem of how to enrich coal gas with oil gas; but I am led to believe that Mr. Young's process is the application of a new principle, or rather of new principles, to the work. The discovery that oil cannot be gasified at one turn through the retort is a valuable one, because it practically abolishes the waste which condensed liquors are, and have been in all former experiments. It is supposed that the difference between radiated heat and contact heat have something to do with it. A retort which is more than half-filled with glowing coke, must give more contact heat than one which is used, as in Mr. Young's case, for the carbonization of oil alone. There have likely been more, but I know of only one other experimenter who has carbonized oil in the retort by itself. This is Mr. J. Mackay, of Peterhead; but his process, as stated by him at the Informal Meeting of Gas Managers held in Glasgow last April, was to draw the coke from a retort and then to charge it with oil, taking thus a charge of coal and a charge of oil time about. This was a very different process from Mr. Young's; because in it the vapours produced in the retort were immediately sent into the coal gas, and both gases were dealt with alike. It will be remembered that Mr. Mackay stated, in the paper on the subject which he read before the North British Association of Gas Managers, at their Stirling meeting, in July, that the illuminating power of the gas (both gases combined) rose satisfactorily while the quantity of oil injected into the retort per charge was not more than 16 gallons, but that above 16 gallons it remained stationary. In the discussion on Mr. Mackay's paper, Mr. J. F. Tocher, who had assisted Mr. Mackay in his working of the oil-enriching process, said that, regarding the reason for this failure to raise the illuminating power, "no definite statement could be made at present." The definite statement can now be made; and it is just simply that the retort was not able to gasify more than 16 gallons in the half-hour which Mr. Mackay allowed for the oil to carbonize. Therefore, when more oil was injected than the retort could deal with, the oily vapours must have returned to the liquid form in condensation. This is shown by the fact that Mr. Young has no tar whatever, whereas Mr. Mackay had from 15 to 25 per cent. of hydrocarbons; and by the further fact that Mr. Young gets a much larger yield of gas per ton of oil. Mr. Mackay, using gas oil, got 17,000 cubic feet of 50-candle gas; Mr. Young, using crude paraffin oil, from which the valuable scale had been extracted, gets 21,000 to 22,000 cubic feet of gas of nearly 100-candle power.

I have used Mr. Mackay's figures because they are the latest, and the highest results to us in Scotland. Other figures have come into my hands—viz., those submitted by Mr. Wells to the Edinburgh and Leith Gas Commissioners relating to his experiments at Leith. Mr. Wells, however, took no pains to separate the coal gas from the oil gas; and therefore comparisons cannot be made. The only points where a comparison is possible, are that Mr. Wells was greatly troubled with the choking of pipes and with sooty deposit, neither of which Mr. Young experiences; and that the gas made by Mr. Wells, when kept for two days, lost about 20 per cent. of its bulk and about 2-candle power. Also, the oil in Mr. Wells's case cost 90s. per ton, as compared with 40s. per ton as used at Peebles. Perhaps the most interesting portion of Mr. Wells's report is contained in a memorandum by a deputation of the Edinburgh Commissioners, who made inquiries on the subject of oil enriching at the South Metropolitan Gas Company's works in April last. These gentlemen reported as follows: "It was stated by Mr. George Livesey that they had tried a great variety of processes for making gas from oil, by the injection of the oil into the retorts; but their experience coincided with that of all others who had tried to effect this during the past seventy years—viz., that it was not practically possible so to make gas for distribution over a large area. If the heat was made high enough to produce permanent gas, the apparatus was constantly being choked up with a sooty deposit. If the heat was lower, so as to avoid this, then the gas produced was not of a permanent character. It . . . . rapidly lost both in quantity and quality, if attempted to be carried to any distance." I give this quotation to show how even a man of Mr. George Livesey's acumen may be mistaken. Of course, he will now see his error; and I presume that no one will be more delighted than he at the discoveries which Mr. Young has made. The advent of his invention puts a stop to all experiments on the old lines. There would be no good in continuing to make oil gas of which a twentieth part condenses, when a better gas can be made without any condensation at all.

Mr. Young's invention has, I understand (since I first mentioned it in this column), created the greatest possible interest among gas managers, to some of whom Mr. Young has very kindly explained it; and all are agreed that it is an invention of great value. There is every probability, therefore, of its being adopted, at an early date, in other gas-works than Peebles. Mr. Bell, the Manager, is giving Mr. Young most efficient assistance in the working of the process, and is recording all the quantities and results; so that any people making inquiry as to the working, will have no difficulty in satisfying themselves as to the utility of the invention. The saving by the use of the process, is not alone in the obtaining of an increased illuminating power at a cheaper rate than it can be produced at present. There is a good return for coke, which is of so excellent a quality, that it is being used for drawing-room fires in Peebles. It also effects a great saving in the cost of labour. The charges run for 24 hours; and a single hand would have mere child's play in attending to, probably, 100 retorts. Altogether, it is safe to say that, since regenerative firing came in, no invention has been made which is more fraught with good to the gas industry than is this solution of the problem that has puzzled so many, of how to use oil in the enrichment of coal gas. There may, and probably will, be improvements in the working out of Mr. Young's process; but the principles he has laid down go so thoroughly to the bottom of the matter, that they can never be superseded. There is one outstanding satisfaction connected with the subject—that the principle is so original, and has been so undreamt of by others, that it will be impossible to pirate it by professions of anticipation.

The work of reconstruction after the elections has been going on busily this week. Nearly all these things are done after a "cut and dry" fashion; but in the case of Hamilton, there was an exception thss year. When the Town Council met on Wednesday last to appoint Committees, Provost Wylie, as he had done with the others, nominated the Gas Committee. A Mr. Tainsh at once got up and said he had as much knowledge of gas making as the whole Committee, and that he thought they should add him to it. A long wrangle took place, in which Mr. Brown, the Convener of the Committee last year, accused Mr. Tainsh of having interfered with the men at the gas-works by going into the works and asking them if any alteration had been made upon the coal that was being used. The discussion turned upon the question whether a Councillor, not on the Gas Committee, was entitled to go into the gas-works and speak to the men. The question is a very important one; and I can imagine two answers to it—the one that he is entitled, so long as he does nothing underhand, and the other that, if the gas manager or the other members of the Committee object, he ought not. Though Mr. Tainsh contended that all he did was merely to put a question to the men, in the Manager's absence, there seemed to be a prevailing idea that the question was put in a spirit which was not friendly to someone, and that conduct such as Mr. Tainsh's should not be encouraged. No formal resolution was arrived at; but I gather the above reflection from the remarks which were made, and from the fact that Mr. Tainsh was not placed on the Committee.

The Police Commissioners of North Berwick have this week affirmed a resolution, passed in September last, to adopt the Burghs Gas Supply (Scotland) Act, 1876.

It was stated at the Broughty Ferry Police Commission on Monday that, since last year, the illuminating power of the gas had been raised from 19 to 27 candles; while, at the same time, the price had been reduced from 4s. 7d. to 4s. 2d. per 1000 cubic feet. It was not stated, however, that this double result was owing to a thorough overhaul of the works, which was made under the direction of Mr. John M'Crae, of Dundee. On the principle of giving honour to whom honour is due, I mention the fact.

The action instituted by Miss Mary Ann Kyd, to recover from the Dundee Gas Commission £180, expended in repairing property belonging to her in Dundee which was damaged by an explosion of gas which took place early on the morning of Jan. 15 last, was tried before Lord Kincairney in the Court of Session on the 3rd. and 4th. inst. The result was a complete victory for the Gas Commissioners, who got a decision with expenses. Miss Kyd's property is situated in a very short street, which is served by a 1-inch main. The main runs under the pavement, about 30 inches from the front wall of the building, and is laid at a depth of 2 feet. At the time of the explosion, there had been about ten days' severe frost in Dundee. On the night previous, it was intimated to the agent of the Gas Commission at Lochee that a smell of gas was noticed in the houses of Miss Kyd's tenants. The agent and the foreman pipe-layer having made an inspection, and failed to find any trace of a leakage inside the premises, it was decided to uncover the main. The officials were unaware that below the floor of the houses in the basement there was an unusually large cavity, which was unventilated. After the gas-main was laid, a sewer drain was put in, across the entire width of the building, several feet below the gas-main; and in filling up the trench for it, the workmen had not been careful to see that the earth was well rammed, with the consequence that it fell away from below the gas-main where this drain crossed it. More than this, it also fell away below the front wall of the building to a depth of several inches; and there was thus a clear passage from the gas-main into the space below the floor. The frost having, it is supposed, caused an expansion of the moist, clayey soil immediately below the pavement, pressure was put upon the gas-main, which, being unsupported, snapped straight across. Then, on account of the frozen condition of the soil, the escaping gas could not get away by the surface, and naturally found its way into the basement of the building. Very shortly after the diggers set to work, the explosion occurred. According to the foreman pipe-layer, it took place immediately after some red-hot cinders fell from the fire; and he attributed the ignition of the explosive compound to that circumstance. The Gas Commissioners, immediately after the accident, compensated the tenants for their losses—an *ex gratia* act which was done on account of the poverty of the people. They were willing also to settle with the proprietrix when she made her claim; but they declined to bear the whole cost, holding that she was at fault and not they. Mr. J. M'Crae, of Dundee, and Mr. R. Mitchell, of Edinburgh, both gave capital evidence for the Gas Commissioners; Mr. M'Crae producing as witnesses a staff of workmen who looked a most capable set of men. The position taken up by the pursuer was that the Commissioners were to blame for not having a stopcock upon the service-pipe; for the main being old and worn out; and for the Commissioners not having inspected it. All three points were entirely negatived. A stopcock on the service-pipe would not have affected a fracture on the main. A portion of the pipe which broke, showing the fracture, was produced in Court, and exhibited no decay, though it has been in use for about 25 years; and the notion of inspecting gas-mains was so ridiculous that, though the Counsel for the pursuers stuck to it, the Court would not entertain it. Lord Kincairney held that the explosion was the result of an accident, for which neither the Gas Commissioners nor their servants were responsible. This was the only conclusion he could have come to in the circumstances.

At last the tide has turned in the world of gas coal. This is shown by the fact that the Cairntable Gas Coal Company, which for the past three years has paid dividends of 7½, 10, and 20 per cent. respectively, has this year returned to 10 per cent. The profits for last year were £5957; and for the preceding year, £12,400. In explanation of the

decreased revenue, the Directors state that "for some years past gas coal rose to an almost prohibitory price; and the result of that was that corporations and gas companies went in more largely for splint coal, and, by adopting chemical processes, succeeded so well that they became almost independent of the gas coal companies. The result of this was a considerable reduction in the price of gas coal, which seems to have affected gas coal dividends very materially."

Mr. Labouchere, or rather a correspondent, has returned to the attack upon the water supply of Glasgow. It is now asserted that the water which is supplied to the city leaves a discoloured slime in filters; and that, after a time, the filters become clogged, and refuse to act at all. The information published in *Truth* is contained in a letter by a firm of filter manufacturers in Glasgow. The filters made by that firm should be avoided. It is a pity that Mr. Labouchere, or anybody else, should be influenced by such statements. The quantity of water necessary to render this particular firm's filters useless, is not given; nor is it stated whether the same thing would not occur in many other towns. It is well known that Loch Katrine water is soft, and is not an ideal water; but that there is impurity in it, has never before been said. In fact, it is regarded as being a particularly pure water. The report of the Analyst for the past year is before me; and it shows the total solid impurity, per 100,000 parts, to be 2·63. With so small a percentage, there is no need for alarm.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 12.

Sulphate of Ammonia.—Following the tendency noted last week, the market has preserved its firmness; and although values are not quotably higher, the position has distinctly improved. Were it not for the tactics of the dealers, a higher level of prices would even now prevail; but this cannot be deferred much longer, when the good demand from almost all quarters is taken into account, the very force of which, granted that it continues, must soon have an appreciable effect. The fact that there is also more interest displayed for forward purchases for delivery into the spring, is a favourable feature; and it is entirely owing to the unwillingness of makers to contract that a greater volume of business cannot be reported. Transactions have taken place at £10 5s. Leith for some months ahead; and the prompt value at all the ports may still be called £10 2s. 6d. Nitrate has advanced; and considerable sales are reported in cargoes at 9s. 1d. to 9s. 4½d., according to shipment—closing very firm.

LONDON, *Nov.* 12.

Tar Products.—Pitch keeps moderately firm; but benzols and the other tar products are as dismal and as difficult to sell as they ever were. The outlook of business is, indeed, for the winter an unhappy one for tar distillers, unless something comes of the much-talked-of combination of distillers, to save the unnecessary slaughtering of prices which has been going on. Prices are as follows: Tar, 10s. Pitch, 27s. 6d. Benzol, 90's, 1s. 6d.; 50's, 1s. 3d. Toluol, 1s. 2d. Solvent naphtha, 1s. 1d. Crude benzol naphtha, 30 per cent., 7d. Creosote, 1¼d. Creosote salts, 20s. Pressed naphthalene, 45s. Carbolic acid, 60's, 1s. 3d.; 70's, 1s. 7d.; crystals, 5½d. Cresol, 10½d. Anthracene, 30 per cent., "A" quality, 10½d.; "B" quality, 8d.

Sulphate of Ammonia.—There is still good business being done in this; and the price has a tendency to improve. Business has been noted at prices ranging from £10 to £10 2s. 6d., less 3¼ per cent. discount. Gas liquor (10-oz.) is quoted at 6s. to 7s. per ton.

COAL TRADE REPORTS.

Lancashire Coal Trade.—The general condition of the coal trade throughout this district can scarcely be reported as altogether satisfactory. The better qualities, suitable for house-fire purposes, are in fairly active demand; but they are not moving off quite so freely as recently. Supplies are ample. Prices have not quite hardened up to the extent that was anticipated at the commencement of the month; and in some cases, low quotations are still being made. The average quoted price for best Wigan Arley at the pit mouth is 12s. 6d., with one or two firms asking 13s.; but here and there sellers are to be found at quite 6d. under this figure, and some of what may be termed the best class of Arley has been sold at as low as 11s. 6d. per ton. Pemberton four-feet and second qualities of Arley average 10s. 6d.; and common house-fire coals, 8s. 6d. to 9s. per ton. The lower qualities of round coal still hang upon the market, owing to the continued very indifferent demand for iron making, steam, and general manufacturing purposes; and for these prices remain low—7s. 6d. being about the full average figure at the pit-mouth. The shipping demand is also very quiet; and good steam coal, delivered at the ports on the Mersey, is not fetching more than 8s. 6d. to 8s. 9d. per ton. At the pit mouth, good qualities of burgy still average about 6s. 3d.; best slack, 5s. to 5s. 3d.; medium sorts, about 4s. to 4s. 3d.; and common, 3s. 6d. per ton. Buyers, however, purchase very cautiously from hand to mouth, in view of the possibility of surplus quantities being pushed upon the market at very low figures.

Northern Coal Trade.—There is still considerable activity in the Northern coal trade; and, with very heavy exports of both steam and gas coals, the best collieries both in Durham and Northumberland seem to have very full work. For best Northumbrian coals, the price is from 9s. 3d. to 9s. 6d. per ton, with a very fair demand; but for second qualities, the demand is less, and from 8s. 6d. to 9s. is the current price. Small steam coals are also quiet, the demand being very fully met owing to the large production; and the price is now from 3s. 9d. to 4s. per ton. Bunker coals are very dull, the tonnage offering being larger than the demand; and the price is from about 7s. per ton for unscreened, up to 10s. per ton for best Durham screened, less discount. In manufacturing coals, there is no special feature, except that the contracts for the next year are being based on lower prices. Durham gas coal is now in very brisk demand; and a heavy output is well taken up. A few contracts are in course of negotiation, including one for Tynemouth. For odd cargoes, the general price varies from 7s. 6d. per ton f.o.b. up to 8s.; but in the case of one or two collieries that have very large contracts, the price asked is 8s. 6d. per ton. Smithy coal is now in less demand, many of the large foreign contracts being about exhausted. In coke, there is a large demand for blast furnace qualities, the price being about 13s. to 13s. 3d. per ton at the furnaces at South Durham and Cleveland. For export coke, 15s. per ton f.o.b. is the general price. Gas coke shows little alteration this week; but there is less scarcity just now, so that the exports are maintained. There is no alteration in prices.

Scotch Coal Trade.—In Scotland, the coal trade looks darker still. The low prices ruling in England are drawing purchasers thither, and the ships are following. It is announced that a large coal order which has for years come to Scotland, has just been placed with Russian coalowners. In addition, it is said, the recent storms have delayed vessels at sea, which has, for this week, led to the exports being down. Reports that several of the big steamship companies and the Egyptian Government have entered into large contracts for Welsh coal, at a reduction of 13 per cent., have had a depressing effect on the market. The only description of coal which is in demand is household. Of gas coal, there is necessarily an increasing output; but being under contract, this does not affect the market, though it gives an appearance of activity. The quotations given (which are, however, not very reliable) are: Main, 7s.; ell, 8s. to 8s. 3d.; splint, 7s. 9d.; and steam, 9s. 3d. to 9s. 6d. per ton. Last week the shipments from Scotch ports were 157,271 tons—a decrease of 18,292 tons upon the preceding six days. Compared, however, with the corresponding week of last year, there was an increase of 28,000 tons. For the year to date, the total shipments have been 6,569,844 tons—an increase upon the shipments for the same period of last year, of 846,937 tons.

Reduction in the Price of Gas at Kineton.—The Directors of the Kineton Gas Company have reduced the price of gas from 5s. 10d. to 5s. per 1000 cubic feet from the commencement of the present quarter.

Sale of Shares.—The following shares in the *Tunbridge Water Company* have changed hands during the past week: Five fully-paid £5 shares, at £8 12s. each; a similar lot, at £8 16s. each; and another lot of six, at £8 18s. each. Six partly-paid shares were sold at £3 16s. per share; five more realized £3 11s. each; and another five, £3 12s. each.

The Suggested Acquisition of the Accrington Gas and Water Undertaking by the Corporation.—The experts called in to advise the Accrington Corporation have reported that the plant and undertaking of the Gas and Water Company are not worth the sum provisionally agreed upon—viz., £720,000. It is understood the negotiations will now be allowed to drop.

Nelson Gas Workers and their Wages.—At a recent meeting of the Gas Committee of the Nelson Town Council, an application was considered from the gas workers for an advance of wages. The stokers, meter inspectors, and labourers all asked for an increase in their wages; and in the case of the stokers, it was decided to advance their wages to 35s. per week, conditionally with extra labour. It was not considered that the meter inspectors had a grievance, and their case was not entertained. The application of the labourers was also refused.

Recent Gas Exhibitions.—On Friday, the 4th inst., a four days' exhibition of Messrs. W. Parkinson and Co.'s gas cooking and heating appliances, held in the Assembly Rooms, Tamworth, was brought to a satisfactory termination. Miss Thwaites gave practical demonstrations of the advantages of gas in culinary operations. The exhibition was well attended. A very attractive exhibition has lately been held under the joint control of the Bradford Corporation Gas Department and Messrs. Richmond and Co., Limited, of Warrington and London, in the Technical College, Bradford. It was opened on the 27th ult. by the Town Clerk (Mr. W. T. M'Gowen), in the presence of the Gas Committee and a large audience, and was continued till the 3rd inst. On the evening of the opening day, Mr. Richmond gave an address. The exhibition was so successful that another, on similar lines, has been arranged to be held at the end of the present month in a different part of the town.

The State Government of San Paulo and the Cantareira Water and Drainage Company.—A meeting of the holders of debenture bonds in the above-named Company (convened by the British Bank of South America, as the issuing house for loans referred to hereafter) was held last Tuesday at the Cannon Street Hotel, E.C., for the purpose of considering the question of the purchase by the Government of the State of San Paulo of the Company's undertaking (the Government assuming entire liability for the debts of the Company) and the substitution of the Government for the Company as liable for the future payments for the service (interest and redemption) of the loans. Mr. C. Carrington, Managing-Director of the Bank, presided; and, in opening the proceedings, he stated that in the years 1875 and 1877, the Company obtained concessions from, and entered into contracts with, the then Provincial Government for a supply of water and a drainage scheme for the city of San Paulo. Later on, in November, 1890, they made a further contract with the State Government for the construction of additional works; but, owing to the condition of the Money Market, they found themselves unable to carry out the extensions. On Aug. 17 this year, a law of the State was passed, authorizing the Government to cancel this last contract, to complete the new works, and to take over those which had already been carried out, subject to the Government taking into their charge the debts contracted in London under a 6 per cent. debenture loan of 1881, which originally stood at £127,000, but had since been reduced by drawings to £98,000, and a 5 per cent. debenture loan of 1888 for £350,000. After the completion of the new works, the State Government proposed to hand everything over to the Municipal Government. The Government had asked the Bank to obtain the transfer of the two loans, and the consent of the holders to the transfer of the works and mortgage deeds. Their sole object was to relieve the shareholders from all further liability in respect of the loans; and he (the Chairman) could not but think that no one would doubt the security offered by the State Government of San Paulo, which was one of the richest, if not the richest province in Brazil. He then proposed a resolution assenting to the transfer; and, after a number of questions had been answered, it was agreed to.

The State of the River Thames.—A correspondent of the *Globe* says: "Outside the outfalls of the main drainage at Barking and Crossness the water is swarming with fish, and quantities of large eels have been caught. This speaks volumes for the pure state in which the river is kept by the main drainage system."

Can a Consumer by Meter Give Away Water?—A case was before the Magistrates at the Morecambe Petty Sessions last Saturday week in which the Local Board sought to recover from a Miss Jenny Dixon 6s. 3d. water-rate for a lock-up shop. It appeared from the evidence that defendant only used a small quantity of water, which was given to her by a Mr. Longmire, who, it was admitted, paid for his supply by meter. The summons was dismissed, on the ground that no one suffered wrong; but a case was granted.

Berlin Water Supply.—Next June the water supply of Berlin, which was strained to the utmost during the summer months this year, will be replenished by the opening of new water-works in the south-east of the capital. The position the new works occupy is a very favourable one, as they are situated on a lake which is well outside the radius of the factories, and where, in addition, the barge traffic is but slight. The water will be purified by means of 22 filters, which have been constructed on the most approved scientific principles.

Liability for Gas-Meters.—At the Westminster County Court, Mr. F. Bayley lately had before him a case in which The Gaslight and Coke Company sought to recover from a consumer named Shackle two meters, or their value, which was put down at £2 8s. A representative of the Company was called, and said that gas was for some considerable time supplied to the defendant at his premises in Berners Mews, Oxford Street; but, owing to his failure to pay the account, it was found necessary to disconnect the service-pipe. Two meters were supplied to him; and, after the gas was cut off, application was made for their return. The defendant, however, refused to give up possession of them, or to assign any reason for detaining them; and consequently the action was brought. The defendant did not put in an appearance; and, in his absence, the Judge made an order for payment of the above-named amount, and costs.

Madrid Electric Lighting and Water Supply.—According to the *Engineer*, it is proposed to build in Spain a great dam on the Guadarrama River, near Torrelodones, where a fall of about 200 feet can be obtained. This can be increased to a total of 1100 feet by building a canal five miles in length. The power obtained will be used to run dynamos, and will be transmitted to Madrid by wire for use in lighting the city and for other purposes. To equalize the power, and provide a supply of water in the dry season, a canal some 15 miles long will be built to connect Lake Pantano with the Guadarrama; the lake being thus utilized as a storeage reservoir. The plan also includes the use of the water after passing the dam and water power to supply the city of Madrid and irrigate the country surrounding it. Madrid has now a very insufficient water supply, and the new project, it is expected, will much improve its health and convenience.

The Pollution of Rivers.—A deputation of members of the West Yorkshire County Council and of representatives of the principal boroughs in the district waited a few days ago upon the President of the Local Government Board, to urge the appointment of a Royal Commission to inquire into the best means of purifying rivers of manufacturing effluents, and as to the expediency of amending the Rivers Pollution Act of 1876, which was said to be almost inoperative in respect to pollution from this source. Mr. Fowler, in reply, pointed out the practical impossibility of passing through Parliament next session a measure fixing the standard of purity for the rivers of the whole kingdom; and he suggested that the local case might be met by the constitution of a Joint Committee for the Aire and Calder basin, having the same powers as those which were possessed by the Lancashire Joint Committee for the Mersey and Irwell.

The Bury Gas and Water Works.—Mr. J. Cartwright, the Borough Engineer and Surveyor to the Corporation of Bury, has issued his annual report. In connection with the gas undertaking, he states that unforeseen circumstances have prevented the completion within the specified time of the contract for the construction of a branch railway from the main line of the Lancashire and Yorkshire Railway to the gas-works. Work has been executed to the amount of £13,000; the value of the land secured for the purpose having been fixed by arbitration at £2105. Referring to the water-works, he says the construction of the Clough Bottom reservoir has continued with very fair results; and, altogether, work to the amount of £17,000 has been carried out. A piece of land 24½ acres in extent, forming part of the site of the reservoir, was acquired for £6767; this amount being fixed by arbitration. The land needed for a catchwater on the south side of the valley has, however, not been obtained, and it is probable that in this case also the price will have to be determined by arbitration.

New Water Reservoir for Ripon.—Last Friday week, the members of the Ripon Corporation and a number of their friends attended the ceremony of turning on the water into a new service reservoir at Whitefields, in connection with the Lumley Moor gravitation scheme. The initial stages of the scheme began in 1886, when the Corporation obtained powers for the construction of a large reservoir at Lumley Moor, six miles from Ripon, at an elevation of 600 feet above Ordnance datum. Previously the town had been supplied with water by pumping from the River Ure, which was very hard water, and liable to be disturbed by floods. The total capacity of the reservoir (which was completed in 1888) was 92 million gallons, being equal to a twelve months' supply for the city. The construction of a service reservoir was delayed on the score of economy; but owing to a breakdown by pipes bursting in the frost of December, 1890, the new reservoir was felt to be desirable; and borrowing powers were obtained for an additional £5000—making the total debt on the new works £30,000. The reservoir has been constructed under the plans and supervision of Mr. S. Harrison, of Ripon; the contractor being Mr. F. U. Simpson, of Burton Leonard. The total cost has been £2448; and the balance of the new capital of £5000, for which borrowing powers were obtained, will be devoted to enlarging the mains in certain parts of the city. The capacity of the new reservoir is 780,000 gallons.

Extension of the Wigan Water-Works.—A Local Government Board inquiry has lately been held at Wigan, in reference, among other things, to an application by the Corporation for power to borrow £12,000 for works required in connection with the water supply of the borough.

Hebden Bridge Water Supply.—The Hebden Bridge Local Board have decided to construct a new reservoir and four filter-beds at Holme Hall. The former is to have a capacity of 550,000 gallons, or equal to about seven days' supply; the latter will each be 24 feet square, with a water depth of 6 ft. 6 in.

An Additional Water Supply for Matlock Bath.—Last Tuesday the Matlock Bath Local Board considered tenders for building a reservoir and laying pipes from what is known in the locality as Brown's Spring, for the purpose of supplementing the present supply to the district. Fifteen tenders were received; and that of Messrs. Farnsworth and Son, of Cromford, was accepted for the reservoir at £657—the pipe contract being let to the Stanton Iron-Works Company for £385. Powers have been granted to the Board to expend £1300 on the scheme.

More "Play Time" for Miners.—The Council of the Yorkshire Miners' Association recently met at Barnsley. Mr. B. Pickard, M.P., President of the Miners' Federation of Great Britain, was present, and delegates representing the whole of Yorkshire also attended. It was resolved to ask that a special conference of the Miners' Federation of Great Britain should be called to consider the question of having an entire week's "play" at Christmas in the whole of the districts belonging to the federation—viz., the Yorkshire, Lancashire, Derbyshire, Nottinghamshire, Staffordshire, Worcestershire, and Cumberland coal districts.

The Smoke Nuisance at the Coventry Gas-Works.—A report on this subject was submitted by the Gas Committee at a recent meeting of the Coventry City Council. During the past three or four weeks, it appears, there has been a considerable abatement in the amount of smoke; and the Committee attribute this to the experience gained by the men in working the new inclined retorts, which are now charged without producing any excessive quantity of smoke. Certain alterations have also been made in the arrangement of chimneys; and the Committee are confident no cause of complaint is now likely to arise. There was no discussion on the report, which was approved.

Fylde Water Company.—The half-yearly general meeting of this Company was held on the 26th ult.; Mr. R. Dunderdale in the chair. In supporting the motion for the adoption of the report and accounts, noticed in the JOURNAL for the 25th ult., Mr. A. W. Clifton said the Directors could hardly be accorded enough praise. They had worked hard, and had brought the Company from paying 4, to paying 10 per cent. A resolution was passed authorizing the raising of a sum not exceeding £10,000 by the creation of a new "B" stock. A sale of £3142 worth of 4 per cent. stock afterwards took place. It was offered in £10 lots. Biddings started at £11; and the lots were disposed of in amounts ranging from £11 11s. to £12 7s. each.

A Water Consumer Fined at Ventnor.—At the Isle of Wight Petty Sessions on the 5th inst., Mr. W. Flux, the owner of Victoria Cottages, Ventnor, appeared in answer to two summonses taken out by the Ventnor Gas and Water Company for wasting their water and for having defective fittings—which rendered the supply liable to contamination. Evidence was given by Mr. J. S. Ineson (the Company's Secretary and Manager), Mr. J. G. Livesay, Mr. Balaam (the collector and inspector), and others. The result was that for the former offence the defendant had to pay a penalty of 10s. and 19s. 6d. costs; but for the latter, being the first case, a small fine of 1s. was imposed. A great deal of interest was taken in the proceedings; many members of the Ventnor Local Board being in Court to hear the case.

Proposed Additional Water-Works for Lisburn.—The Town Commissioners of Lisburn have had under consideration, and have adopted, a report by Mr. John Lanyon, on a scheme for augmenting the existing water supply. It appears that the present storeage capacity of the reservoirs is 24,500,000 gallons; and, in order to ensure a supply in dry seasons, Mr. Lanyon suggests that storeage should be provided for four months, which would be equal, in round figures, to 46,000,000 gallons. The improvements to the reservoirs which he proposes will cost £6700, including land. In addition, he considers it desirable that filter-beds and a clear-water basin, holding three days supply, should be constructed; and he estimates the cost of these at £1000 to £1200. To improve the distribution system, £1300 will have to be spent. With the price to be paid to Lady Wallace for the water to be taken, the total cost of the scheme will amount to £17,000.

The Libourne (France) Water-Works.—In a recent number of the *Engineering Record* there were some particulars, translated from the *Nouvelles Annales de la Construction*, of the works established for the supply of the port of Libourne with water. Formerly the water was taken partly from wells exposed to contamination from sewage, partly from the Dordogne River, and partly from artesian wells. These sources becoming insufficient, the city has now constructed a system supplied from the Dordogne nearly 7 miles above the city. The water first passes through two Anderson purifiers with a capacity of 33,000 gallons per hour each, and thence through a canal, with numerous aërating weirs, to a trough, from the perforated bottom of which it is delivered in slender streams to the settling-chambers, where the sediment is collected behind special dams. There are ten filter-chambers, each 59 ft. by 23 ft., and covered by an iron-framed cement arch of 23-feet span and 3 inches thick, supporting a 16-inch layer of earth. The chambers are connected in five pairs, four of which are in constant operation, and have a united daily capacity of about 775,000 gallons of water. The filters are drained through their brick inverts, which are covered with 10 inches of gravel, diminishing in size to the top, which is covered with a 2-feet bed of sand, the surface of which is 2 ft. 9 in. below water-level. During the day, the water which has been filtered at night is drawn off to a reservoir and pumped into a covered storeage and distributing reservoir, which is roofed with iron-framed cement arches sustaining a 20-inch bed of earth. The works have cost about £30,000.

The Supply of Water for Fires, &c., at Finchley.—The Finchley Local Board have decided to appeal against the decision of the Justices at the Highgate Petty Sessions, on the 3rd ult., in the action brought by the Local Board against the Barnet Gas and Water Company on the above matter, and reported in the JOURNAL for Oct. 11 (p. 641).

Gas v. Steam Engines for Pumping Water.—At the meeting of the Wolverhampton Town Council last Wednesday, the Water-Works Committee reported that they found the cost of working at the Goldthorn Hill pumping-station to be so great that they thought it advisable to abandon the present steam-engine and put down a gas-engine and work the station by gas-power. The total working expenses for the year ending March 31, 1892, were £495 12s. 5d.; and the estimated working expenses under gas-power were £245—showing a saving of £250 a year. The action of the Committee was approved.

A Peculiar Occurrence in the Liverpool Gas Supply.—A large number of gas consumers in Liverpool were temporarily deprived of a supply on Tuesday evening by a curious accident. It seems that a workman at the Gas Company's Linacre station inadvertently turned on a wrong valve, with the result that there was an extremely powerful rush of gas along the mains; the pressure being so great that it deranged hundreds of the small wet meters, and practically cut off the supply in those cases. In some instances, the usual method of putting a little water in the meter rectified the evil; but this was not generally successful, and on Wednesday a large band of inspectors were busy all day putting the meters right.

The Wolverhampton Corporation and the Gas-Works.—In the annual report of the General Purposes Committee presented at the meeting of the Wolverhampton Town Council on Wednesday last, reference was made to the proposed purchase of the gas-works. They stated that early in the year a Sub-Committee was appointed to confer with the Directors of the Gas Company with the view of ascertaining whether they were prepared to sell the gas undertaking, and if so, on what terms and conditions. To enable them to deal with the subject, the Committee deemed it necessary to engage an expert; and they accordingly sought the assistance of the Chief Engineer of the Birmingham Corporation Windsor Street Gas-Works (Mr. Charles Hunt). After careful investigation, the Committee, in view of the recommendations of the Sub-Committee, and with the prospect of an early installation of the electric light, are of opinion that the negotiations should be suspended for the present, as upon the terms submitted by the Company, the question of purchase could not be reasonably entertained.

New Joint-Stock Companies.—The Billericay Gas Company, Limited, has been formed with a capital of £5000, in 1000 shares, to manufacture and supply gas in Billericay and other places in Essex and elsewhere. The San Nicholas Water-Works Company, Limited, with a capital of £60,000, in £5 shares, is to adopt and carry into effect an agreement made between Charles Dawney and Bruce Thornbury and the Company, to supply the city of San Nicholas and the neighbourhood with water, and to construct and maintain sewage, drainage, and sanitary works of every description in the Argentine Republic. The Coal Brick Syndicate, Limited, has been registered with a capital of £150,000, in £1 shares, to adopt and carry into effect an agreement for the acquisition from Mr. T. W. Lee of the benefit of certain inventions relating to the utilization of coal dust, and to develop them; further, to carry on, in all their respective branches, the businesses of briquette machine manufacturers, colliery proprietors, coke manufacturers, ironmasters, ironfounders, steel makers and converters, miners and smelters, quarrymen, engineers, brick makers, coal merchants, stone merchants, tar merchants, asphalte makers, chemical manufacturers, &c.

The Lighting Question at Askam.—The important question of the establishment of gas-works for the supply of Askam, especially for lighting its streets, occupied the attention of the Dalton Local Board at their meeting on the 31st ult. It came up on the recommendation of the Lighting Committee that the tenders of Messrs. Tattersall and Sons for plant (£550) and Mr. G. Martin for the building (£467) should be accepted. The plans and estimates for the works had been prepared by Mr. J. Swan, of Ulverston. The Chairman (Mr. J. Walter) moved the adoption of the recommendation; remarking that he found, from figures, that gas could be made for 3s. 4¾d. per 1000 cubic feet. Dr. Challinor seconded the motion. Mr. Hamer protested that the matter had been "sprung" upon the Board, who had not, he said, had a chance of inspecting the specifications or the tenders. He was greatly surprised to hear the Chairman say that the price of gas would be 3s. 4¾d. per 1000 cubic feet, because he had not taken into account the charge on the works of £1700 which had been already expended, and which would have to be considered. He proceeded to cite figures in support of his contention that, by the scheme proposed, it would be impossible for the private consumers to avail themselves of the gas, because it could not be produced at double the figure which the Board were authorized to charge—viz., 5s. 6d. per 1000 cubic feet. If they carried out the scheme, it would mean 1d. in the pound on the rates, and not far from £400 per annum for the lamps. Dr. Challinor remarked that the Committee simply worked on Mr. Swan's plans, and had nothing to do with any others. He did not know where Mr. Hamer had obtained his information; but if they carried out his suggestion they would never have a light at Askam. He had wantonly obstructed the Committee in their work. Mr. Hamer strongly objected to this statement. Mr. Lawn said they should have built the works five years ago. The only question before the Board was the acceptance of the tenders, which were based on estimates already sanctioned. Mr. Hamer asked Mr. Lawn if he thought gas could be made for the price stated by the Chairman. Mr. Lawn replied that he did not. The Chairman said that, taking the capital charges, including the £1700, gas could be produced for 7s. 7¾d. per 1000 cubic feet; but it was not necessary to take this amount into consideration. Mr. Hamer said the Chairman's figures were all wrong. The Chairman retorted that the same could be said about Mr. Hamer's. This gentleman afterwards moved that the whole matter be referred to a special meeting. Eventually, however, the Committee's recommendation was agreed to.

Electric Lighting for Yarmouth.—At last Tuesday's meeting of the Yarmouth Town Council, a report by a Special Committee on the subject of electric lighting was introduced to the attention of the members. It recommended that an installation of 4500 lamps of 8-candle power be provided at a cost of £10,000; and that application be made to the Local Government Board for power to borrow this sum. A report was also submitted by Mr. Preece, who has been advising the Committee. In this he stated that electricity at 6d. per Board of Trade unit was equivalent to gas at 3s. per 1000 cubic feet; and in Yarmouth the Corporation would be able to supply it easily and profitably for 6d. per unit, and thus they would compete with gas, which was at present 3s. 4d. per 1000 cubic feet. Then he informed the Committee that the cost of gas was increasing. Labour troubles, the restriction in the market for residuals, and the price of coal combined to aid this upward movement; while, on the other hand, the price of electrical energy was declining. Having submitted some particulars to show that corporations were able to supply electrical energy considerably cheaper than companies, he dealt with the prospects of an undertaking in Yarmouth. There were roughly, he said, 31,000 gas-lamps supplied in the borough; and he regarded it as a very low estimate when he calculated that 10,000 electric lamps would be adopted in the course of two years. The average revenue per lamp fixed might be taken at 10s. per annum at 6d. per unit; and thus 10,000 lights would produce a revenue of £5000. The working expenses might be taken at 50 per cent. of the gross receipts; and thus a profit of £2500 would be available for the payment of interest on loan, the provision of a sinking fund, and for the reduction of the rates. While he did not anticipate any difficulty in obtaining this business, he did not recommend the Council to go in for the 10,000 lamps to commence with, as a growth of business was easily met by an extension of plant. As to street lighting, he said that one arc lamp would replace four gas-lamps, and give a very much better effect. Four ordinary gas-lamps in Yarmouth cost annually £13 4s.; and one arc lamp would cost £14 for the same period. When these reports came up for consideration, Mr. Palmer suggested that the matter should be postponed and dealt with by a Committee, consisting of the whole Council, with Mr. Preece in attendance. This was unanimously agreed to.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 852.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	14 Oct.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	10⅞—11⅛	..	6 10 5
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 4
100,000	20	27 May	8	Bahia, Limited	20	11—12	..	13 6 8
200,000	5	12 May	7½	Bombay, Limited	5	6—6½	..	5 15 9
40,000	5	,,	7½	Do. New	4	4¼—4½	+⅛	6 13 4
380,000	Stck.	12 Aug.	12½	Brentford Consolidated	100	212—217	..	5 10 7
150,000	,,	,,	9½	Do. New	100	163—168	..	5 10 1
220,000	20	15 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
888,500	Stck.	31 Aug.	5	Bristol	100	104—108	..	4 12 7
320,000	20	29 Sept	11½	British	20	41—43	..	5 4 8
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	14½—15½	..	5 9 8
328,750	10	—	—	Buenos Ayres (New) Limited	10	7—8	..	—
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	98—101	+1	5 18 10
150,000	20	12 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	14 Oct.	13	Commercial, Old Stock	100	232—237	..	5 9 8
165,000	,,	,,	10	Do. New do.	100	180—185	..	5 8 1
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	123—128	..	3 10 4
800,000	Stck.	15 June	10	Continental Union, Limited	100	227—232	..	4 6 2
200,000	,,	,,	7	Do. 7 p. c. Pref.	100	190—195	..	3 2 7
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185—190	..	5 5 3
486,090	10	28 July	10	European, Limited	10	19½—20½	..	4 17 7
354,060	10	,,	10	Do. Partly paid	7½	14—15	..	5 0 0
5,470,820	Stck.	12 Aug.	12	Gaslight & Coke, A, Ordinary	100	217—222	..	5 8 1
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95—98	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	258—263	+1	3 16 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	116—121	..	4 2 7
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	166—171	..	4 7 8
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	162—167	..	4 3 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	255—260	..	3 16 11
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	150—154	..	3 17 11
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	123—127	..	3 10 10
908,000	,,	,,	6	Do. 6 p. c. do	100	165—170	..	3 10 6
3,800,000	Stck.	12 May	12	Imperial Continental	100	227—230	..	5 4 4
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	4—4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	106—108	..	4 12 7
541,920	20	15 June	5	Monte Video, Limited	20	14—15	..	6 13 4
150,000	5	27 May	10	Oriental, Limited	5	8⅛—8¼	..	5 14 3
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—5	..	7 0 0
166,870	10	—	2	Pará Limited	10	2—3	..	—
420,000	100	2 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	103-107⅝	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	104—106	..	5 13 2
150,000	10	—	10	San Paulo, Limited	10	8½—9¼	..	—
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	287—292	..	5 6 2
1,350,000	,,	,,	12	Do. B do.	100	232—237	..	5 1 3
230,000	,,	,,	13	Do. C do.	100	241—246	+1	5 5 8
725,000	,,	14 July	5	Do. 5 p. c. Deb. Stk.	100	140—144	..	3 9 6
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	225—230	..	5 0 0
				WATER COMPANIES.				
743,952	Stck.	1 July	10	Chelsea, Ordinary	100	246—251	+1	3 19 8
1,720,252	Stck.	14 Oct.	8	East London, Ordinary	100	197—202	..	3 19 2
544,440	,,	1 July	4½	Do. 4½ p. c. Deb. Stk.	100	140—144	..	3 2 6
700,000	50	1 July	8½	Grand Junction	50	103—108	+1	3 18 8
708,000	Stck.	12 Aug.	11	Kent	100	270—275	+6	4 0 0
1,043,800	100	1 July	9½	Lambeth, 10 p. c. max.	100	216—221	+1	4 6 0
406,200	100	,,	7½	Do. 7½ p. c. max.	100	190—194	..	3 17 3
285,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	122—125	..	3 4 0
500,000	100	12 Aug.	12½	New River, New Shares	100	325—330	+2½	3 3 6
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	130—133	+1½	3 0 2
902,300	Stck.	15 June	6½	S'thwk & V'xhall, 10p. c. max.	100	146—149	..	4 7 3
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	135—140	+1½	4 12 10
1,155,066	Stck.	15 June	10	West Middlesex	100	241—246	+1	4 1 3

The Water Supply of Bradford Out-Townships.—A meeting of representatives of the Local Boards of Pudsey, Farsley, and Calverley was held at Leeds last Tuesday, to decide what action they should jointly take to bring to a close the negotiations with the Bradford Corporation in regard to the water supply of the Boards' districts. After the subject had been thoroughly discussed, it was unanimously decided to accept the twenty years' agreement which the Corporation had offered.

The Water-Works Question at Chatham and Rochester.—At a meeting of the Rochester Town Council on Friday evening, it was resolved to promote a Bill in Parliament to acquire that portion of the Brompton, Chatham, Gillingham, and Rochester Water Company's undertaking lying within the City of Rochester; the supply to be derived from the Strood Water-Works. It was also resolved to oppose the proposition of the Chatham Corporation to obtain parliamentary powers to acquire the Brompton, &c., Company's undertaking.

Water and Sanitary Works in France.—The numerous projects that are in hand to improve the sanitary condition of some of the chief towns of France, as well as to give them a more abundant supply of water, are, says the *Engineer* in the course of a recent article, being elaborated upon the schemes that have long been adopted in England. In face of such a high rate of mortality at Rouen, Havre, and Marseilles, as compared, for instance, with that of London, Lincoln, and Glasgow, the French authorities think they cannot do better, before putting their projects into execution, than study the means whereby the municipal councils in England have succeeded in so largely reducing the death-rate. The delegates who recently visited England with a view to examine into the water and other municipal works have returned to Paris; and they express themselves highly satisfied with everything that they have seen. M. Pétrot, the Vice-President of the General Council, inspected the installations of the Lambeth Water Company, while some of his colleagues went to Kew. He expresses himself as favourably struck with the filter-beds; though it is his opinion that it would be safer for the health of the population if the sand composing the beds were entirely changed, instead of being merely washed by powerful water-jets. The system, however, though primitive, has the advantage of being very simple, and giving excellent results. With some improvement, these results would, no doubt, be still more satisfactory; and until such time as Paris is wholly supplied with spring water, M. Pétrot thinks the Municipal Council cannot do better than adopt this scheme. Its cost would not be very great; and it would be infinitely preferable to distributing contaminated water during the summer months, just at the time when an abundant supply of pure water is most needed. There is some question also of having sanitary inspectors in France, similar to those appointed by the local governing bodies in England, as it is believed that by this means alone can it be hoped to deal satisfactorily with the problem of improved sanitation—an improvement which is becoming year by year more necessary. At Rouen, especially, the sanitary arrangements are of a most imperfect description; and instead of being, on account of its splendid situation on the Seine, one of the healthiest cities of France, it enjoys the doubtful honour of possessing a very high rate of mortality—the average death-rate being 33·60 per 1000. In order to grapple with this serious evil, a Commission was lately appointed to examine into the whole system of sanitation, and to suggest means whereby it could be ameliorated. Two reports have been issued—one by Dr. Guillemin, and another by M. Belleville, an Engineer of the Ponts et Chaussées—and several projects have been presented; the principal schemes being those of M. Gogeard and M. Aimont. The proposal of the former is to establish two collectors, one in the higher and another in the lower part of the town, together with a basin on the left of the Seine to collect the water on each side of the river. The sewage would be disposed of as a fertilizing agent on the plain of Dissel; thus carrying out in its entirety the *tout-à-l'égout* system. M. Aimont's scheme is to collect the sewage on the right side of the river in one collector. It would be sent across the Seine by means of a syphon to a pumping-station, which would also receive the sewage of the left bank; and, as in the other project, it would find its way into the open country. Nothing definite has yet been decided upon by the Rouen authorities; but it is likely, in view of the favour with which the Paris Municipal Council look upon the *tout-à-l'égout* system, that either one or the other of these proposals will be ultimately adopted.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON." **GWYNNE & CO.,** TELEPHONE No. 2698.

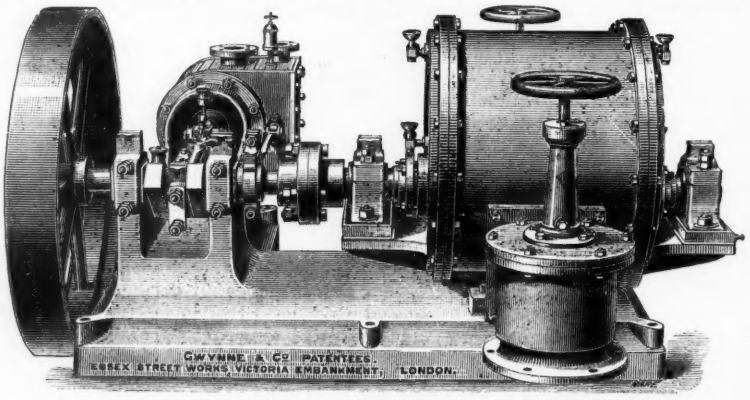
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES HYDRAULIC REGULATORS, VACUUM GOVERNORS STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 182, Gresham House, Old Broad Street, LONDON, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. I., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore, Particulars and price, apply to Mr. T. L. ARCHER, Cathedral Chambers, Half Street, MANCHESTER.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OXIDE OF IRON. Genuine Natural Bog ORE. QUALITY AND CONDITION GUARANTEED. Any quantity supplied at lowest rates.
D. M. NELSON AND SONS, 68, Bath Street, GLASGOW. Telegraphic Address: "Gas, Glasgow." Depôts throughout England and Scotland.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEAR DALKEITH, }

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

MR. J. C. CHAPMAN, Fellow of the Chartered Institute of Patent Agents, advises on all matters connected with LETTERS PATENT FOR INVENTIONS and the PROTECTION OF TRADE MARKS, &c., at home and abroad. Preliminary Information and Handbook on application.
70, Chancery Lane, LONDON, W.C.

THE Advertiser, who has spent Three Years in the Laboratory of Professor Foster, of the Middlesex Hospital, and has had subsequent experience in assisting him, wishes for employment in a Gas-Works. He is willing to assist generally in Office and Works.
Address A. S. V., 103, Finsbury Park Road, LONDON, N.

WANTED, by a young married Man (Abstainer), a Situation as WORKING GAS MANAGER. Used to Engine, &c. Will have to give three months' notice to leave present management.
Address No. 2153, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Fitter by a respectable Man, well up in Iron and Compo., Main and Service laying, Stoves, Meter fixing and indexing. Good character.
Address No. 2156, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a competent Gas-Fitter, a Situation in a Gas-Works to lay Mains and Services, fix Meters and Stoves, and do House fitting and General fitting on Works. Abstainer. Good reference.
Address No. 2157, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Situation as Inspector in a Country Gas-Works. Thorough experience in all Branches, including Meter Indices (Gas and Water), and keeping all Books appertaining to a District. Can personally attend to Consumers' complaints, and be generally useful in Office or on Works.
Address O. W. DOUGAN, 1, Surrey Lane South, Battersea, LONDON, S.W.

NEW GAS-LAMP.

AN Engineer and Manufacturer for Gas and Water Installations in Germany (Prussia) is open to undertake the AGENCY for a superior NEW GAS LAMP or BURNER.
Advertiser is a thorough Gas Specialist, in possession of sufficient means, and can ensure large Sales. Highest references.
Address E. O. 656, care of Haasenstein and Vogler, A.G. Magdeburg, GERMANY.

ENGINEER wanted (Coal and Water Gas) for important Works in South America, one speaking Spanish preferred. Must be thoroughly competent in every department, capable of preparing Estimates, and have full knowledge of working Water Gas.
Apply by letter, stating capabilities, past experience, age, and terms, to A.X., care of Messrs. Waterlow and Sons, Limited, LONDON WALL, E.C.

WANTED, at a small Gas-Works in Yorkshire, a young Man about 18 years old, to act as YARDMAN and make himself generally useful. A suitable willing young Man would have an opportunity of learning the routine of Gas Making, and be employed permanently.
Apply to the MANAGER, Gas-Works, Purston, PONTEFRACT.
Nov. 12, 1892.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company require the services of an experienced person as ASSISTANT MANAGER, ENGINEER, and SECRETARY, at a Salary of £300 per year.
Applications, endorsed "Assistant Manager," enclosing not more than three recent testimonials, to be sent to the Directors not later than Wednesday, the 16th of November.
Gas Office, Rochester,
Oct. 20, 1892.

GUILDFORD GASLIGHT AND COKE COMPANY.

WANTED, a Cast-Iron Tank, about 32 ft. by 16 ft. by 8 ft.
Particulars on personal application to Mr. Lloyd, Manager, Gas-Works, Guildford.
By order,
WILLIAM LONGWORTH,
Secretary.
Gas Offices, Guildford,
Nov. 5, 1892.

SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

THE Goring and Streatley District Gas and Water Company invite APPLICATIONS for a few unallotted 5 per cent. DEBENTURE BONDS.
Full Particulars, with Forms of Application, may be obtained from the Secretary, W. H. HARDY, Esq., 5, Great Winchester Street, LONDON, E.C.

WANTED, Offers of Muriate of Ammonia (crude and refined), and all other Ammonia and Tar Products.
RINAU-KESSEL AND CO., Cologne, GERMANY.

FOR SALE—A Gasholder 36 feet diameter by 15 feet deep, made by C. & W. Walker.
Apply to THE UNITED ALKALI COMPANY, LIMITED, Jarrow Works, SOUTH SHIELDS.

FOR SALE—A perfectly new 20,000 cubic feet per hour EXHAUSTER, with Steam-Engine combined, including Hydraulic Gas Governor, Bye-Pass Valves, and Connections.
For further particulars, apply to Mr. T. G. MARSH, 41, Corporation Street, MANCHESTER.

CAST-IRON TANK AND GASHOLDER FOR SALE.

THE Chelmsford Gaslight and Coke Company have for immediate disposal a CAST-IRON TANK, 32 ft. diameter by 17 ft. 6 in. deep, and a GASHOLDER, 30 ft. diameter, complete with columns (five in number), Guides, Pulleys, Inlet and Outlet Pipes, Valves, &c.
Any further information to be had of the undersigned on application.
E. G. SMITHARD,
Engineer.
Gas-Works, Chelmsford,
Nov. 11, 1892.

BOROUGH OF WARRINGTON.

TENDERS FOR SCRUBBER.

THE Gas Committee of the above Borough are prepared to receive TENDERS for a TOWER SCRUBBER, about 70 ft. by 12 ft.
Further information can be obtained on application to Mr. W. S. Haddock, Engineer, Gas-Works.
Sealed tenders, endorsed, must be addressed to the Chairman, and sent in not later than the 21st inst.
FREDK. TAYLOR,
Secretary.
Gas Offices, Warrington,
Nov. 4, 1892.

SULPHATE OF AMMONIA.

THE Directors of the Isle of Thanet Gas Company are open to receive TENDERS for about 10 tons of SULPHATE OF AMMONIA.
The Directors do not bind themselves to accept the highest or any tender.
Tenders to be sent in on or before Nine a.m. on Friday, Nov. 18, endorsed "Sulphate of Ammonia," addressed to the Chairman of the Company.
Further particulars and samples may be had on application to
THOMAS C. FULLER,
Secretary.
Gas-Works, Margate,
Nov. 10, 1892.

COUNTY BOROUGH OF BURY.

TO IRON ROOF AND GIRDER MAKERS.

THE Gas Committee of the Corporation of Bury invite TENDERS for the making and erecting of IRON ROOF COLUMNS and GIRDERS in connection with their Coal-Stores at the Gas-Works, Elton, pursuant to the Drawings and Specification prepared by Mr. W. H. S. Gendall, Gas Engineer, from whom further particulars may be obtained, and also Copies of the Specification, with Quantities and Form of Tender, on payment of Two Guineas, which sum will be returned upon receipt of a *bonâ fide* Tender.
Tenders, endorsed "Tender for Iron Roof," to be sent to me, the undersigned, on or before Monday, Nov. 21, 1892.
JOHN HASLAM,
Town Clerk.
Corporation Offices, Bury,
Nov. 2, 1892.

SHEFFIELD UNITED GASLIGHT COMPANY.
NEEPSEND AND ARUNDEL STREET STATIONS.

TO GASHOLDER MAKERS.

THE Directors of this Company invite TENDERS for the repair and re-sheeting of the Two OUTER LIFTS of a GASHOLDER at each of the above Stations. The Gasholder at Neepsend is 151 ft. diameter by 30 ft. deep, and at Arundel Street 110 ft. diameter by 24 ft. deep.
Forms of Tender, with Bill of Quantities, may be obtained, and the Specification seen, on application to the Engineer, Mr. Fletcher W. Stevenson, at the Company's Offices, Commercial Street.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for Repairing Gasholders," and addressed to the undersigned, must be delivered at the Company's Offices by post, not later than Saturday, the 3rd day of December next.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
Nov. 12, 1892.

LIQUOR and Tar wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS and WAKEFIELD.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street London, W.
Lux's Gas Regulators for every consumption.
Lux's single-stem Pressure-Gauges.
Lux's Regulator for Gas-Engines.
Lux's Gas-Balance.
Lux's new Gas Regulator for Inverted Lamps and other Apparatus for Gas Lighting, &c.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF NEW CAPITAL.

NOTICE is hereby given, that the Directors are prepared to receive TENDERS for £25,000, being the fifth portion of the New Perpetual Debenture Stock of the Company, to bear Interest at 4½ per cent. per annum, free of Income-Tax, such tenders to be delivered at the Company's Offices, St. Helen's Place, in the City of London, not later than Twelve o'clock Noon, on the 13th day of December, 1892, and payment of accepted tenders made on the 23rd of December.
Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.
By order of the Court of Directors,
ISAAC ADOLPHUS CROOKENDEN,
Secretary.
St. Helen's Place, London,
Nov. 5, 1892.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing BY AUCTION of GAS and WATER SHARES under Parliamentary Powers.
He also holds MONTHLY SALES of GAS and WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.
The next Sale will take place at the Mart, on Tuesday, Nov. 29, at Two o'clock precisely, by order of the Executors of the late Mrs. E. Randall and Others, of £4500 of 4 per cent. PERPETUAL DEBENTURE STOCK and £450 of ORDINARY "B" STOCK (paying 8½ per cent. Dividend) in the Tottenham and Edmonton Gaslight and Coke Company.
Terms for including Shares in these Sales, and all particulars relating thereto, may be had of Mr. ALFRED RICHARDS.
Offices: 18, FINSBURY CIRCUS, E.C., and TOTTENHAM.

PUBLICATIONS

ISSUED BY

WALTER KING,

11, BOLT COURT, FLEET STREET, LONDON, E.C.

ALL PARCELS SENT CARRIAGE FREE.

THE FLOW OF GASES & PROPORTIONING GAS-MAINS. — FOUR DIAGRAMS (with explanatory pamphlet) for determining at a Glance the various Problems involved in Proportioning Gas Mains and Services to suit the varying conditions of Diameter, Length, Pressure, Specific Gravity, and Discharge, with Notes as to the allowances to be made for Bends, Branch Mains, and other Disturbing Influences.—By F. SOUTHWELL CRIPPS, Assoc. M.Inst.C.E. Price 7/6.

THE SCIENCE AND PRACTICE OF LIGHTING as applied to Streets, Open Spaces, and Interiors. — By W. H. Y. WEBBER. Price 3/6.

THE CHEMISTRY OF ILLUMINATING GAS. —By NORTON H. HUMPHRYS, Assoc.M.Inst.C.E., F.C.S. Price, bound in cloth, 6/-.

ANALYSIS OF THE ACCOUNTS OF THE METROPOLITAN WATER COMPANIES.—Issued Annually, as compiled and arranged by ALFRED LASS, F.C.A. Twelfth year, 1891-92, price 15/-. Previous volumes still on sale.

PRACTICAL PHOTOMETRY: A GUIDE TO THE STUDY OF THE MEASUREMENT OF LIGHT.—By W. J. DIBDIN, F.I.C., F.C.S., Chemist and Superintending Gas Examiner to the London County Council. Price 7/6, cloth, bevelled boards.

THE GUIDE-FRAMING OF GASHOLDERS, AND OTHER PAPERS, CHIEFLY RELATING TO STRAINS IN STRUCTURES CONNECTED WITH GAS-WORKS. — By F. SOUTHWELL CRIPPS, Assoc.M.Inst.C.E. Bevelled cloth, price 6/-.

TABLES OF VALUES, DISCOUNTS, DIVIDENDS, AND WEIGHTS AND MEASURES, FOR USE IN GAS OFFICES.—Arranged by THOMAS NEWBIGGING, M.Inst.C.E. Reprinted from the Second Edition of the "Gas Manager's Handbook." In limp glazed cloth, lettered, price 2/-.

Complete List of Publications on Application.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

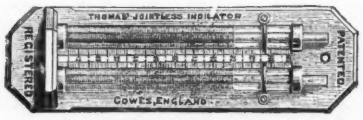
Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

CASES FOR BINDING
VOLUMES OF THE "JOURNAL"
(GREEN CLOTH, GILT LETTERED)
Price 2s. each.

NOW READY.
GAS AND WATER CO.'S DIRECTORY, 1892.
Sixteenth Annual Issue, 5s.
GAS-WORKS STATISTICS, 1892.
Fourteenth Annual Issue, 3s. 6d.
WATER-WORKS STATISTICS, 1892.
Twelfth Annual Issue, 2s. 6d.
Handsomely Bound in One Vol., Price 10s.
LONDON: HAZELL, WATSON, & VINEY, Ltd., 1, CREED LANE, E.C.

ALEXANDER RUSSELL & CO.,
Cannel and Gas Coal Merchants,
53, WATERLOO STREET,
GLASGOW.



THOMAS'S JOINTLESS GAS GAUGES.
COWES, I.W.
American Patent for Sale.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time labour, and expense.
For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.
Prices are Reduced.

AUG. KLÖNNE,
DORTMUND (GERMANY).
REGENERATIVE FURNACES.
Unsurpassed in
Efficiency, Economy, Durability, and Easy Working.

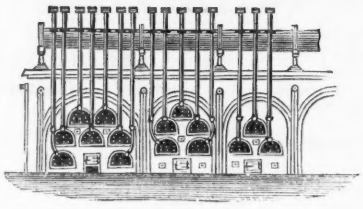
MEIKLEJOHN'S PATENT
Improved Slide-Valve Anti-Dip.
Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.
Is cheap and easily fixed to any form of main.
Will be found the most efficient appliance of the kind yet introduced.
Further particulars and price from
C. MEIKLEJOHN,
GAS-WORKS, RUGBY.
(Late N. MEIKLEJOHN, Longwood.)

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

HOLMSIDE GAS COALS.
(Wrought out of Holmside and South Moor Collieries.)
PRESENT production over 3200 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of over
400,000 Tons per Annum.
Full particulars on application to
MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-ON-TYNE.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

DEMPSTERS'



RETORT-SETTINGS,
RETORT-FITTINGS,
ELLAND.

THOMAS TURTON
AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.
Prices and Analysis of all the Scotch Cannels on application.

To effect a great saving in
GAS-FURNACES use our
Special Derbyshire GANNISTER BRICKS.
ADDRESS
JAMES WHITE & Co., Limited,
ALBERT WORKS, WIDNES.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.
NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

THE SILICA FIRE-BRICK
COMPANY,
OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS,
BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.
Trade Mark: "SILICA."
These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY
Strongly recommended where EXCESSIVE HEATS have to be maintained.

ALEX. C. HUMPHREYS, M.E.,
General Superintendent & Chief Engineer,
The United Gas Improvement Company, U.S.A.

A. G. GLASGOW, M.E.,
Late General Inspector,
The United Gas Improvement Company, U.S.A.

HUMPHREYS & GLASGOW,

Contracting Engineers for Water Gas Plant,
9, Victoria Street, London, S.W.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Danish Gas Company of London, Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON, FITTER.

CAST-IRON PIPES

FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES

FOR GAS, WATER, AND STEAM.

TELEGRAMS "PIPES GLASGOW."

WM. MACLEOD & CO.,

56, ROBERTSON STREET, GLASGOW.

T. B. KITTEL, SHEFFIELD.

CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL

ENGLISH & SCOTCH CANNELS.

REAL SILKSTONE GAS COAL

ANALYSIS AND PRICES ON APPLICATION.

T. B. KITTEL, SHEFFIELD.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·68 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE.
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

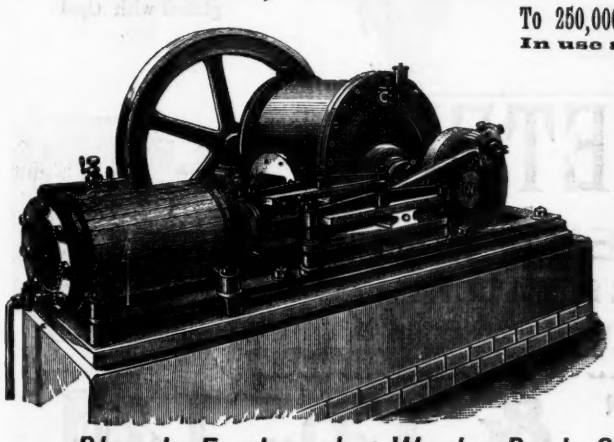
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

G. WALLER & CO.'S NEW PATENT GAS EXHAUSTER.

MADE, with FOUR or THREE BLADES,

To 250,000 Cubic Feet per Hour, with or without Engine combined.

In use and on order for over 100 Works, equal to 3,850,000 Cubic Feet per Hour.



SPECIAL ADVANTAGES:

This Four-Blade Exhauster will pass fully 15 per cent. more per revolution than any other Four-Blade Exhauster with the same size cylinder, and with from 15 to 30 per cent. less friction or driving power, and without oscillation.

It will pass fully 50 per cent. more per revolution than any Two-Blade Exhauster, with very little increase in driving power for the increased delivery.

No other Exhauster gives such a steady gauge.

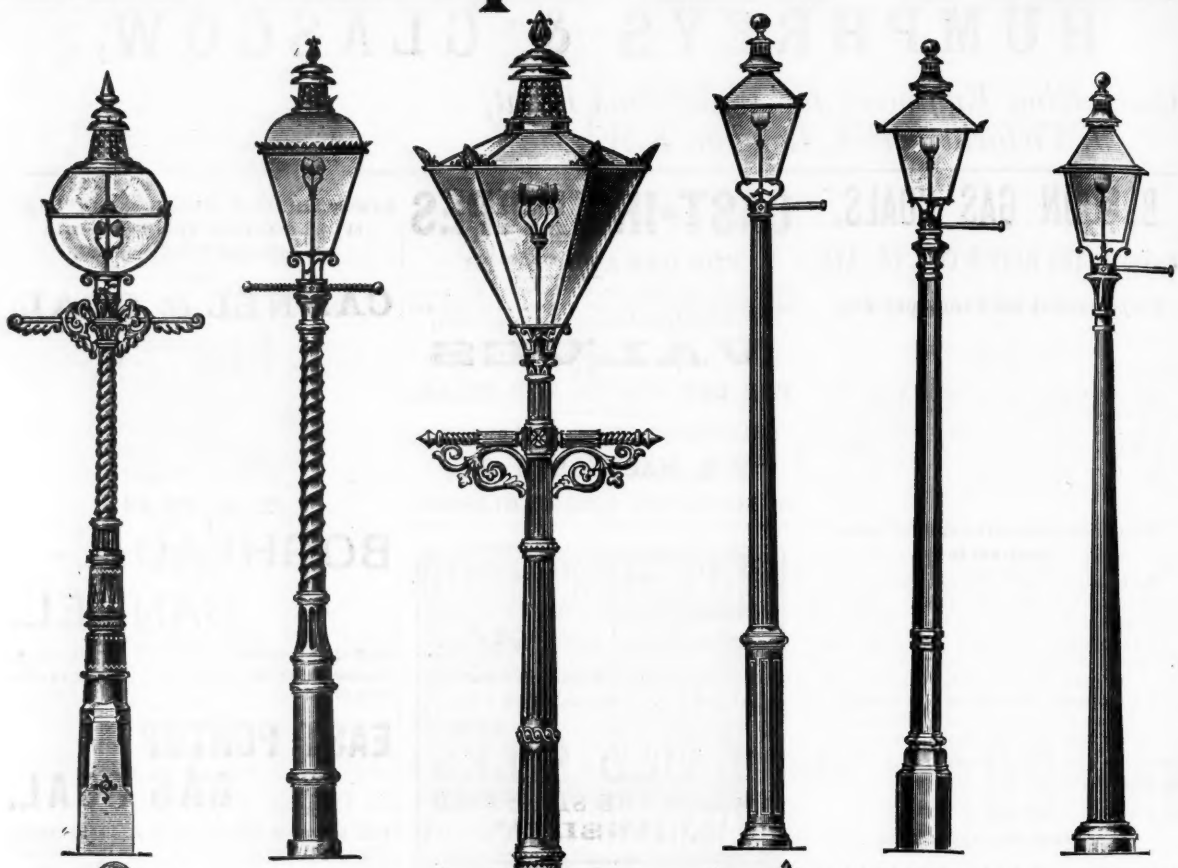
OLDEST MAKERS of BEALE'S EXHAUSTERS for 300 WORKS.

MODEL OF PATENT EXHAUSTER SENT FOR INSPECTION.

Patent Compensating Steam Governors. Special Tar-Pumps.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.

Gas Lamps and Posts.



Several thousands of these are now in use, giving general satisfaction. They are strongly made, and of best material.

Patent Street Lamps.

NO PUTTY.

Lamplighters' Torches.

Lever Taps.

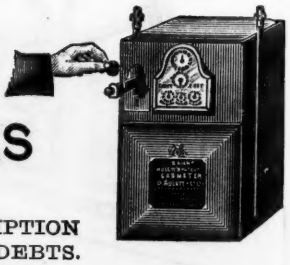
Lamp Governors.

PRICE LIST ON APPLICATION.

SPECIAL HIGH-POWER LAMPS.

For Lighting Streets, Refuges, Promenades, &c., where a good light is required. Fitted with Porcelain cone, Copper top and perforation, Wrought-Iron Spray, Lever Tap, Burner and Patent Governor, glazed with Opal top.

GAS-METERS.



PREPAYMENT METERS

(PRICE'S PATENT)

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONG SMALL CONSUMERS. NO RISK OF BAD DEBTS.

D. HULETT & Co., Ltd.,

55 & 56, HIGH HOLBORN, LONDON.

Now Ready. *Price One Shilling.*

METROPOLITAN WATER SUPPLY.

CONSIDERATIONS AFFECTING THE

ADEQUACY AND CONTROL

OF THE

WATER SUPPLY TO THE METROPOLIS.

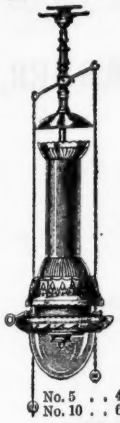
BY

E. H. STEVENSON and E. K. BURSTAL, M.M.Inst.C.E.

LONDON:

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

The "POPULAR."



The FULLFORD

REGENERATIVE GAS-LAMP.

SIMPLEST
MOST ECONOMICAL
MOST RELIABLE
} IN THE MARKET.

IN THREE SIZES, 60, 120, AND 180 CANDLE POWER.

BEST IN THE WORLD FOR OUTSIDE SHOP LIGHTING

Sole Licensees and Manufacturers,

The LAMP MANUFACTURING Co., Ld.,

12 & 14, LEONARD STREET,

CITY ROAD, LONDON, E.C.

No. 5 . . 45s.
No. 10 . . 68s.

ILLUSTRATED PRICE LIST FREE ON APPLICATION.

WILLIAM INGHAM & SONS,

Incorporated with the Leeds Fire-Clay Company, Ltd.,

WORTLEY FIRE-CLAY WORKS

Near LEEDS

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

BOX'S NEW PATENT

RETORT-LID FASTENER.

For Illustrated Description, see JOURNAL, Aug. 23, p. 346.

CANNOT GET OUT OF ORDER.

DOES NOT DAMAGE LIDS.

SIMPLE AND EFFECTIVE.

CHEAP AND DURABLE.

For Prices and Particulars, apply to

W. W. BOX,

Gas-Works, CRAYFORD, Kent.

BEST

GAS COAL. REAL OLD SILKSTONE GAS COAL,

Address THE STRAFFORD COLLIERIES COMPANY,

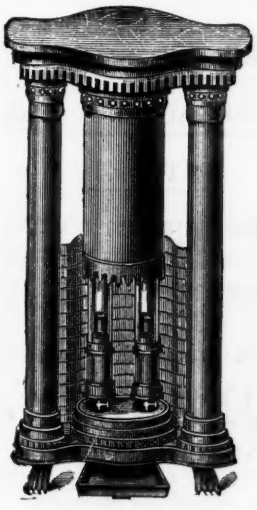
Near BARNSLEY, SOUTH YORKSHIRE.

HEATHCOTE GAS COAL.

Comparison confidently invited with the best Yorkshire, Welsh, and Derbyshire Coals in Yield, Candle Power, Quantity of Coke, Tar, and Liquor.

LARGE AND INCREASING OUTPUT.

THE GRASSMOOR Co., Ld., CHESTERFIELD.



THE "SYPHON" (REGISTERED TITLE.)

(CLARK'S PATENT.)

Hygienic Gas Heating-Stoves

For Use Without a Flue.

NO FLUE REQUIRED. NO SMOKE. NO SMELL.
NO DIRT OR TROUBLE. NO DANGER.

All Sulphurous Vapours are condensed inside the Stoves, and passed off as liquid into the tray beneath.

The "SYPHON" Hygienic Gas Heating-Stoves give a pure, equable, and agreeable heat, which can be graduated and sustained at the will of the user. They are so constructed that a moist or dry atmosphere is obtained at pleasure.

They are the Only Safe Stoves for use in Greenhouses, Conservatories, Bed-rooms, &c., and especially suitable for Halls, Sitting-Rooms, Offices, Shops, Schoolrooms, and Theatres.

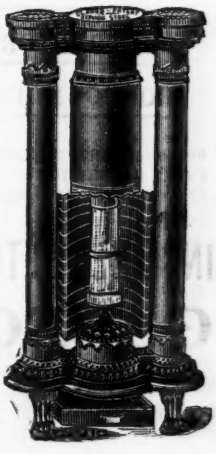
Adopted by the principal Gas Companies throughout the Kingdom.

Illustrated Price Lists on application to

S. CLARK & CO., Patentees and Makers,

Syphon Works, Park Street, Islington, London, N.

Telegraphic Address: "Syphon Stoves, London."



JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY,

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
C X C	"JACKSON"	BECK & Co.,
MARK.	CLAY CROSS.	130, GT. SUFFOLK ST., S.E.

GODDARD, MASSEY, & WARNER'S

IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICE, APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms–

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (Four Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations–

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

JONAS DRAKE & SON,

TELEGRAPHIC ADDRESS:
"DRAKESON, HALIFAX."

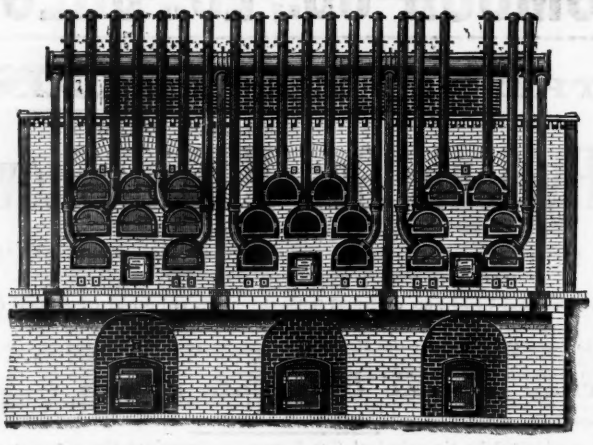
TELEPHONE No. 43.
HALIFAX EXCHANGE.

GAS ENGINEERS,

CONTRACTORS,

IRONFOUNDERS,

BUILDERS AND ERECTORS OF EVERY DESCRIPTION OF OVENS, BENCHES, KILNS, FURNACES, &c.



RETORT SETTERS,

FURNACE BUILDERS

ETC., ETC.

REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S, VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

INCLINED RETORTS

GASEOUS FIRING A SPECIALTY.

RETORT SETTING IN ALL ITS PRINCIPLES AND BRANCHES. BENCHES FITTED UP COMPLETE.

OVENDEN, HALIFAX.

DRAWINGS, SPECIFICATIONS AND ALL OTHER PARTICULARS ON APPLICATION.

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON Offices & Depôts:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET.
LEEDS

LONDON OFFICE:
60, QUEEN VICTORIA STREET
E.C.

CLAYTON SON & CO. LTD.

MAKE A SPECIALTY OF GASHOLDERS

AND MAKERS OF
GAS PLANT OF EVERY DESCRIPTION.

REG? TELEGRAPHIC ADDRESS:
"GAS LEEDS"

THE WIGAN COAL & IRON CO., LIMTD.,

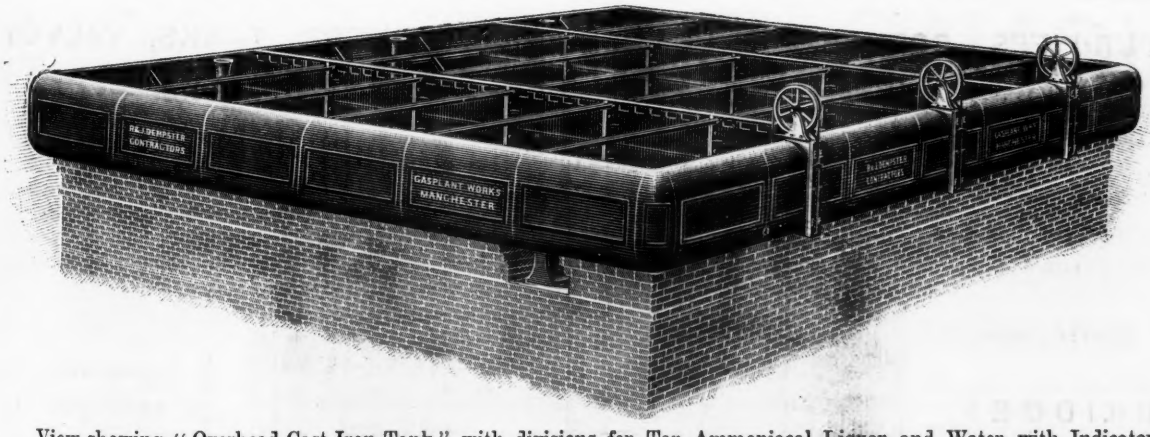
Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE ST., BIRMINGHAM—SOLE AGENT: A. C. SCRIVENER.
TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.
TELEGRAPHIC ADDRESS: "PARKER LONDON."

TANKS

WITH PLANED JOINTS.



View showing "Overhead Cast-Iron Tank," with divisions for Tar, Ammoniacal Liquor, and Water, with Indicators and Overflows to each compartment, and prepared for Wood or Sheet-Iron Covering.

For Estimates, Designs, and any other Information, apply to

R. & J. DEMPSTER,

GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

London Offices: 181, Gresham House, Old Broad Street, E.C.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

FOR RETORT-SETTINGS & FURNACE WORK

OF EVERY DESCRIPTION,

Messrs. J. & H. ROBUS,

20, BUCKLERSBURY, LONDON, E.C.,

ARE PREPARED TO SUBMIT PLANS, SPECIFICATIONS, AND ESTIMATES.

Contractors for the complete Erection of Gas and Water Works, including Main Laying.

THE HORSELEY CO., LTD., TIPTON, STAFFORDSHIRE,

MAKERS OF

GAS HOLDERS & GAS PLANT,

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES

PIPES, LAMP PILLARS. RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

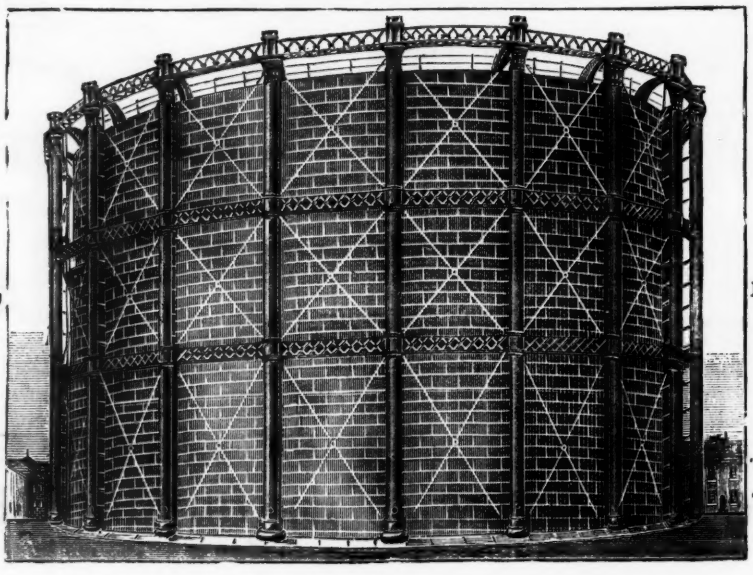
STRUCTURAL IRON

AND STEEL WORK.

BRIDGES,

ROOFS,

PIERS, ETC.



WORKS & HEAD OFFICE:
TIPTON,
STAFFORDSHIRE

LONDON OFFICE:
11, VICTORIA ST.,
WESTMINSTER.

TELEGRAPHIC ADDRESSES:
"HORSELEY, TIPTON."
"GALILEO, LONDON."

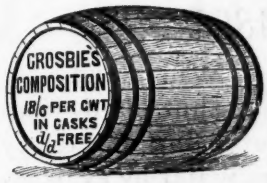
Gas-Bags for Mains. High-Water Boots. Woollen Miners' Jackets.

Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpaulin Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c. India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber. Stokers' Gloves, 14s. per dozen.

Write for Price List to

THOMAS BUGDEN, Manufacturer,

116 & 118, GOSWELL ROAD, LONDON, E.C.



USED AT THE GAS-WORKS

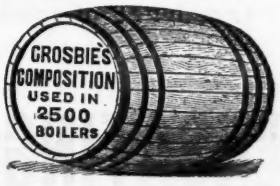
AT

Ascot, Ballymena, Birmingham, Broadstairs, Bromsgrove, Chesterton, Hendon, Ilkeston, Kildwick, Knutsford, Leven, N.B., London, Pembroke, Seaham Harbour, Stamford, Stroud, Harwich, Uttoxeter, Wigston, Workington, &c., &c., and by Corporations and leading Engineers throughout the Country, for preventing

BOILER INCRUSTATION.

Absolutely Harmless and free from Acids.

Crosbie's Paints for Gas-Works. Economical and Durable.



ADOLPHE CROSBIE, Ld.,
Chemical Works, Wolverhampton.

S. PONTIFEX & CO.,

GAS and WATER ENGINEERS,

Manufacturers of and Contractors for the Maintenance of

PUBLIC LAMPS & LANTERNS;

GLASS—Flint, Opal, and Bent in Stock, and Cut to Sizes.

WELL LAMPS, STREET NAME TABLETS,

LAMP COLUMNS, HEAD IRONS, PUTTYLESS LAMPS,

LANTERNS COCKS, REGULATORS,

Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

BROWN'S PATENT
LAMPLIGHTERS' TORCHES.

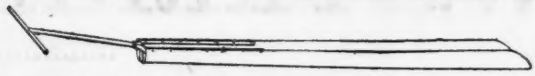
PROPRIETORS AND MANUFACTURERS OF
BOX'S PATENT
PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

S. PONTIFEX & CO., 22, COLEMAN ST., LONDON.

Works: 18, STEPHEN STREET, TOTTENHAM COURT ROAD, W.

STEEL SCOOPS
FOR
RETORT CHARGING.



Scoops supplied with or without handles, and of any dimensions or shape required.

HENRY SYKES, Engineer,
66, BANKSIDE, LONDON, S.E.

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,

LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.

Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND

ESTABLISHED 1836.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S 'PATENT' GAS MAIN SYPHONS.

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

CLAYTON, SON, & CO.

LIMITED,

LEEDS,

LONDON OFFICE, 60, QUEEN VICTORIA STREET, E.C.

MAKE

RETORT LIDS

OF ALL FORMS AND SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC
MACHINERY.

PRICES ON APPLICATION.

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"

A 280-CANDLE POWER

PLAIN IRON LAMP,

CLASS A— 55/-

LIGHT for LIGHT

less than half the price of any other Regenerative Lamp.

Manufactured in England by

HENRY GREENE & SONS,

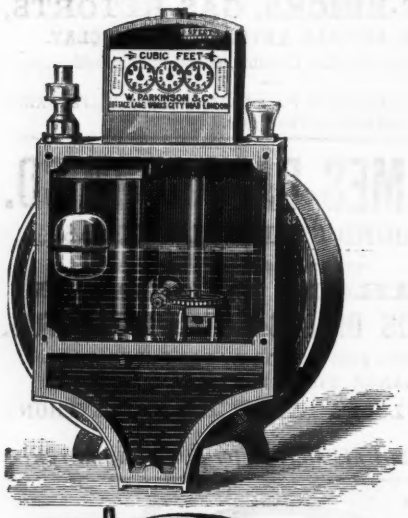
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.

W. PARKINSON & CO.

— ESTABLISHED 1816 —

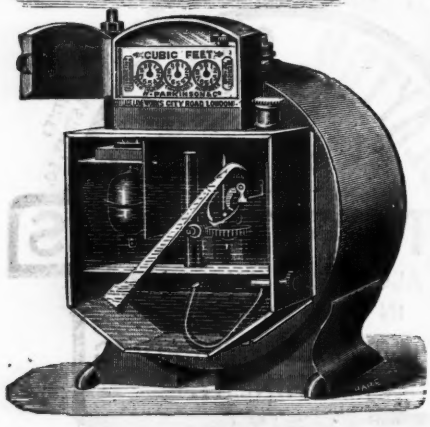
THE ORIGINAL MANUFACTURERS OF WET METERS.



ORDINARY WET METERS

IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.



COMPENSATING METERS

IN TINNED OR CAST-IRON CASES.

The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.

DRY METERS.

These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected and the brasswork and smaller fittings are of superior workmanship.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."

[See also Advt., p. 848.

London: Printed by WALTER KING (at the Office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Nov. 15, 1892.